

AD-A066 377

ARMY DUGWAY PROVING GROUND UTAH  
DUST/DEBRIS TEST CONDUCTED AT FORT SILL, OKLAHOMA BY DUGWAY PRO--ETC(U)  
SEP 78

F/G 19/4

UNCLASSIFIED

DPG-FR-78-313-VOL-1

NL

1 OF 3

AD  
A066377





AD A0 66377

DDC FILE COPY

AD Q

RDTE Project No. \_\_\_\_\_

TECOM Project No. 7-CO-RD8-DPI-005

DPG Document No. DPG-FR-78-313

Test Sponsor \_\_\_\_\_

Program Manager for  
Smoke/Obscurants

TRADOC AC No. \_\_\_\_\_

**LEVEL** *HI*

A063391

DUST/DEBRIS TEST

CONDUCTED AT

FORT SILL, OKLAHOMA

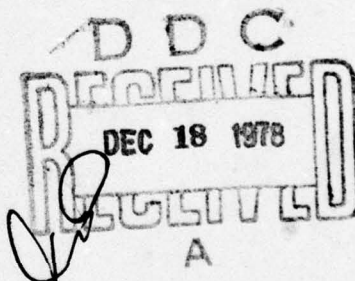
BY

DUGWAY PROVING GROUND

FINAL TEST REPORT

VOLUME 1

SEPTEMBER 1978



U.S. ARMY DUGWAY PROVING GROUND

Dugway, Utah 84022

**DISTRIBUTION STATEMENT A**  
Approved for public release;  
Distribution Unlimited





AD \_\_\_\_\_  
RDTE Project No. \_\_\_\_\_  
TECOM Project No. 7-CO-RD8-DPI-005  
DPG Document No. DPG-FR-78-313  
Test Sponsor Program Manager for  
Smoke/Obscurants  
TRADOC AC No. \_\_\_\_\_

DUST/DEBRIS TEST  
CONDUCTED AT  
FORT SILL, OKLAHOMA  
BY  
DUGWAY PROVING GROUND

FINAL TEST REPORT  
VOLUME 1

SEPTEMBER 1978

**DISTRIBUTION STATEMENT A**

Approved for public release  
Distribution Unlimited

**U.S. ARMY DUGWAY PROVING GROUND**  
**Dugway, Utah 84022**

V2-AD-A063391

78 12 11 015

### DISPOSITION INSTRUCTIONS

WHEN NO LONGER NEEDED, THIS DOCUMENT WILL BE DESTROYED BY DEPARTMENT OF THE ARMY ORGANIZATIONS IN ACCORDANCE WITH THE PROCEDURES GIVEN IN AR 380-5. OTHER AGENCIES WILL DESTROY THIS DOCUMENT IN ACCORDANCE WITH THE PROCEDURES GIVEN IN THEIR APPROPRIATE REGULATIONS.

### DISCLAIMER

THE FINDINGS IN THIS DOCUMENT ARE NOT TO BE CONSTRUED AS AN OFFICIAL DEPARTMENT OF THE ARMY POSITION UNLESS SO DESIGNATED BY OTHER AUTHORIZED DOCUMENTS. THE USE OF TRADE NAMES IN THIS REPORT DOES NOT CONSTITUTE AN OFFICIAL ENDORSEMENT OR APPROVAL OF THE USE OF SUCH COMMERCIAL HARDWARE OR SOFTWARE. THIS REPORT MAY NOT BE CITED FOR PURPOSES OF ADVERTISEMENT.

ACCESSION BY		
NTIS	White Section	<input checked="" type="checkbox"/>
DDC	Buff Section	<input type="checkbox"/>
UNANNOUNCED		<input type="checkbox"/>
JUSTIFICATION		
<i>After on file</i>		
BY		
DISTRIBUTION/AVAILABILITY CODES		
Dist.	AVAIL. and/or SPECIAL	
A		

78 12 11 135

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
TECOM Project No. 7-CO-RD8-DPI-005		9
4. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED
Dust/Debris Test conducted at Fort Sill, Oklahoma by Dugway Proving Ground.		Final Report, May - Sep 78
6. AUTHOR(s)		7. PERFORMING ORG. REPORT NUMBER
Volume 1.		DPG-FR-78-313-Vol 1
8. CONTRACT OR GRANT NUMBER(s)		
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
US Army Dugway Proving Ground Dugway, UT 84022		
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
Project Manager for Smoke ATTN: DRCPM-SMK-T Aberdeen Proving Ground, MD 21005		September 1978
13. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		14. NUMBER OF PAGES
US Army Test and Evaluation Command ATTN: DRSTE-AD-M Aberdeen Proving Ground, MD 21005		510
15. SECURITY CLASS. (of this report)		16. DECLASSIFICATION/DOWNGRADING SCHEDULE
UNCLASSIFIED		
17. DISTRIBUTION STATEMENT (of the Report)		
Distribution limited to US Government agencies only. Other requests for this document must be referred to: US Army Test and Evaluation Command, ATTN: DRSTE-ME, Aberdeen Proving Ground, MD 21005.		
18. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
19. SUPPLEMENTARY NOTES		
20. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Dust/Debris      Extinction coefficient      Cloud luminance Cloud characterization      Obscuration effectiveness Particle size      Cloud density Field test      Transmittance		
21. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
This test program was conducted, at the request of PM Smoke, to characterize battlefield dust/debris at Fort Sill, Oklahoma during May 1978. Twenty trials involving 155 and 105 mm artillery shells and four trials involving vehicular movement were conducted. Data were collected using Dugway Proving Ground's electro-optical instrumentation, particle size analyzer, dust samplers, photographic methods along a single instrumented line of sight. The required visual, near, mid, far IR transmittance data, dust sampler data were collected. Estimates of extinction coefficients for Fort Sill dust are provided.		

### SUMMARY OF RESULTS

At the request of PM Smoke, 24 trials were conducted during May 1978, to characterize clouds resulting from battlefield dust/debris at Fort Sill, Oklahoma. Twenty trials characterized clouds from exploding munitions (155, 105 mm) and four trials characterized clouds resulting from vehicular movement. The requested cloud characteristics included visual transmittance, infrared transmittance (near, mid, far), dust sampler dosages, particle size distributions, extinction coefficients and cloud growth dimensions. In addition to the required characteristics, data were provided for cloud luminance ( $1.06 \mu\text{m}$ ), integrated concentrations along the line of sight, calculated visible transmittance, moisture content assay and weapons data.

FORWARD

This test program was requested and supported by the PM Smoke.

Dugway Proving Ground was responsible for the test planning, test execution, and test reporting.

Fort Sill was responsible for logistical support, site survey, meteorological support, necessary weapons, personnel and ammunitions, and range control and safety support. The support of the Fort Sill personnel is gratefully acknowledged.

## TABLE OF CONTENTS

	<u>PAGE</u>
SUMMARY OF RESULTS . . . . .	i
FORWARD . . . . .	ii

### SECTION 1. INTRODUCTION

1.1 BACKGROUND . . . . .	1
1.2 DESCRIPTION OF MATERIEL . . . . .	1
1.3 TEST OBJECTIVES . . . . .	1
1.4 SCOPE . . . . .	1

### SECTION 2. DETAILS OF TEST

2.1 OBJECTIVE . . . . .	3
2.2 CRITERIA . . . . .	3
2.3 DATA ACQUISITION PROCEDURES . . . . .	3
2.4 RESULTS . . . . .	7
2.5 ANALYSIS . . . . .	9

### SECTION 3. APPENDICES

A TEST CRITERIA (not used) . . . . .	A-1
B TEST DATA . . . . .	B-1
C DEFICIENCIES, SHORTCOMINGS AND SUGGESTED IMPROVEMENTS . . . .	C-1
D MAINTENANCE DATA (not used) . . . . .	D-1
E REFERENCES . . . . .	E-1
F ABBREVIATIONS . . . . .	F-1
G DISTRIBUTION LIST . . . . .	G-1

## SECTION 1. INTRODUCTION

### 1.1 BACKGROUND

In virtually any battlefield environment, significant amounts of airborne dust/debris will be produced by vehicular exhaust, vehicular motion, exploding artillery projectiles, by burning materiel and structures and other causes, quite apart from deliberately generated smokes and obscurants. Such airborne materials degrade visual observation, a fact which had been recognized many years ago and served as the stimulus for the development of smokeless powder. Smokeless powders provided relief from the obscuring effects of battlefield operations but that advantage was relatively short-lived. In more recent times, battlefield haze has again assumed major significance because of the massive use of munitions and vehicles, and because of the increasingly important role of sophisticated weapons and instruments whose effectiveness may become impaired whenever airborne substances interfere with the propagation of visible and infrared light.

As requested in References 1 and 2, 20 dust/debris trials and four vehicular movement trials were conducted at Fort Sill, Oklahoma in May 1978 in an attempt to quantify the obscuring effects of dust/debris. Results of these trials are presented herein.

### 1.2 DESCRIPTION OF MATERIEL

Dust and dust/debris were generated by both vehicular movement and explosive munitions. Table 1 indicates the obscurant sources by trial.

### 1.3 TEST OBJECTIVES

The objective of the test was to characterize dust and dust/debris produced from vehicle traversals, muzzle blasts and exploding projectiles.

### 1.4 SCOPE

This test program consisted of 24 trials in which obscurants were generated from exploding projectiles and vehicle traversals. In an effort to quantify characteristics of the clouds related to obscuring effectiveness, data were collected using transmissometers operating at several wavelengths, dust samplers, and particle size analyzers.

Table 1. Summary Trial Data

TRIAL NUMBER	DATE	DUST SOURCE	NUMBER OF ROUNDS
P1	14 May 78	Vehicle Move.	NA
P2	14 May 78	Vehicle Move.	NA
P3	14 May 78	Vehicle Move.	NA
P4	14 May 78	Vehicle Move.	NA
T3 <sup>a</sup>	16 May 78	155 mm	1
T4	16 May 78	155 mm	3
T5	16 May 78	155 mm	3
T6	16 May 78	155 mm	3
T7	16 May 78	155 mm	3
T8	16 May 78	155 mm	3
T9	16 May 78	155 mm	2
T10	16 May 78	155 mm	2
T11	16 May 78	155 mm	2
T12	17 May 78	105 mm	1
T13	17 May 78	105 mm	1
T14	17 May 78	105 mm	1
T15	17 May 78	105 mm	1
T16	17 May 78	105 mm	1
T17	17 May 78	105 mm	1
T18	17 May 78	105 mm	1
T19	17 May 78	105 mm	1
T20	17 May 78	105 mm	1
T21	17 May 78	105 mm	4
T22	17 May 78	105 mm	5

<sup>a</sup>Data did not record on tape for Trials T1 and T2.

## SECTION 2. DETAILS OF FORT SILL DUST TEST

### 2.1 OBJECTIVE

Same as paragraph 1.3

### 2.2 CRITERIA

None.

### 2.3 DATA ACQUISITION PROCEDURES

#### 2.3.1 Test Location

This test program was conducted on a sampling grid (Figure 1) located approximately at the center of the Quanah Range, Fort Sill, Oklahoma. The gun position was 5800 meters east of the sampling grid at fire point 12.

#### 2.3.2 Meteorological Limitations

a. There were no meteorological limitations for ambient temperatures, relative humidity or cloud cover.

b. Precipitation: None.

c. Wind speed: Sufficient wind speed to move dust cloud through the sampling line. The upper limit was to be determined by the DPG test officer as high wind speeds cannot be allowed to generate dust clouds that would interfere with test measurements.

d. Wind direction: Within  $\pm 45^\circ$  from the normal to the sampling line.

#### 2.3.3 Grid Configuration

The test grid was configured for one line of sight 1106 meters long. Figure 1 shows the instrumentation locations and Table 3, Appendix B, gives the Universal Transverse Mercator Coordinates (including elevation) of the instrumentation as provided by the Fort Sill survey personnel. The command post was located on the north end of the grid adjacent to the receivers.

#### 2.3.4 Sampling

Dust sampling was accomplished using 15 high-volume samplers with 102 mm glassfiber pads. These samplers were located along the line of sight as indicated in Figure 1 and they were spaced approximately 15 meters apart.

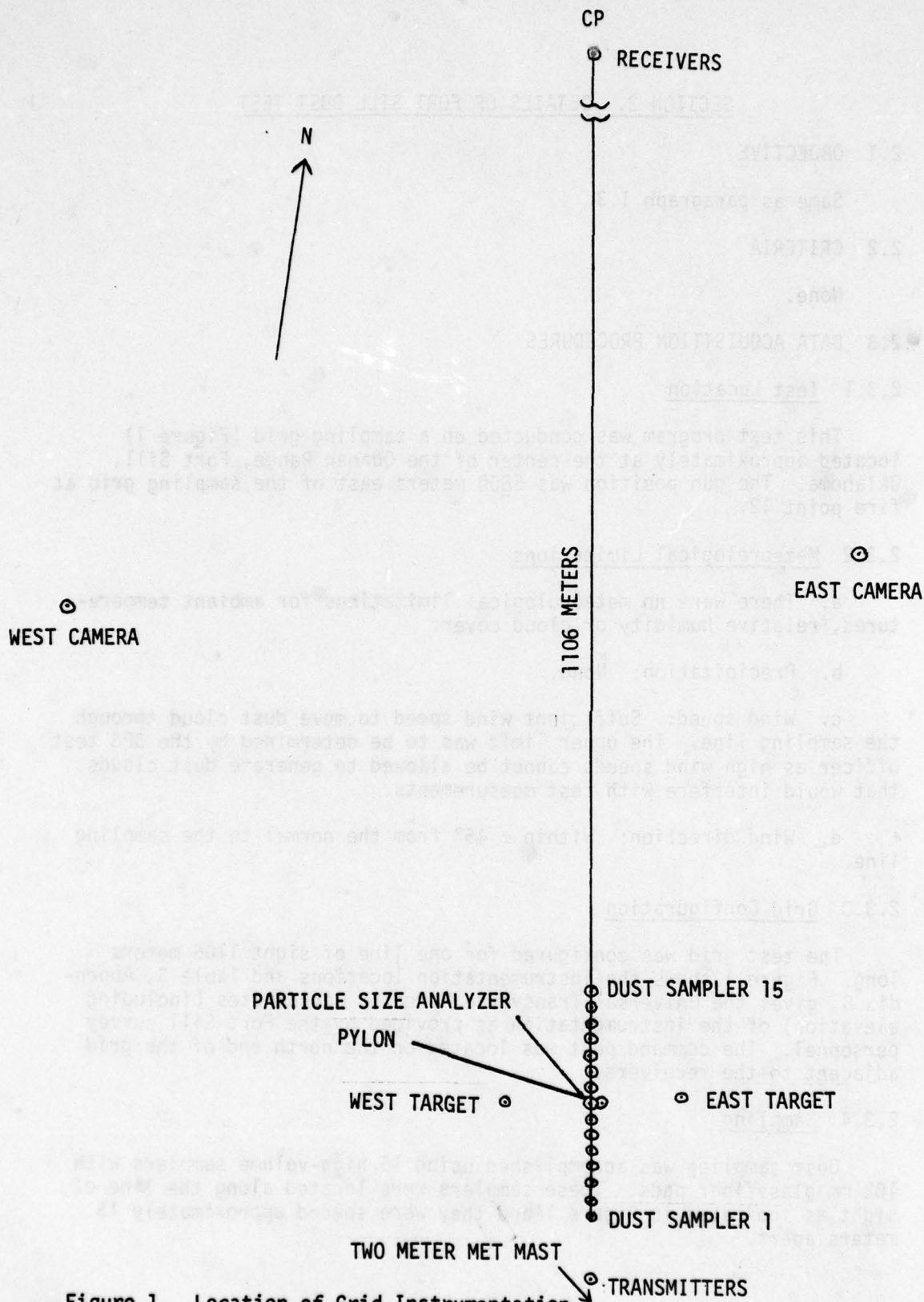


Figure 1. Location of Grid Instrumentation.

### 2.3.5 Optical Instrumentation

a. Optical instrumentation included a telephotometer and three transmissometers. All electronic equipment was activated two hours prior to the start of each day's testing to initiate operational checks and calibration. Operational checks and calibration were completed at least 15 minutes prior to the beginning of a trial. Within two minutes prior to each trial, initial readings (no cloud) were taken for the telephotometer (0.4 - 0.7  $\mu\text{m}$ ) and for the transmissometers (1.06, 3.4, 9.75  $\mu\text{m}$ ).

b. Transmittance measurements in the visible portion of the spectrum were accomplished using a telephotometer equipped with photopic corrective filter (0.4 - 0.7  $\mu\text{m}$ ) and 200 mm lens of 2-minute arc aperture. The telephotometer was located at the receiver position (Figure 1). Over the 1100 meter pathlength, the telephotometer was focused on a visible light source. The beam of light was chopped at a constant frequency (on one half second, off one half second) to permit elimination of scintillation and background. The frequency at which the light was chopped was recorded.

c. Transmittance at 1.06  $\mu\text{m}$  was measured using a transmissometer receiver monitoring a chopped energy source located at the opposite end of the grid. The chopping frequency of the source was monitored and recorded. This instrumentation was also employed to measure cloud luminance at 1.06  $\mu\text{m}$ .

d. Transmittance at 3.4  $\mu\text{m}$  and for the 8 - 12  $\mu\text{m}$  band was measured using Nernst glowers as sources and bolometer sensors in parabolic mirrors. The chopping of the systems was monitored and recorded with the receiver data. All receivers were located near the CP position and their associated sources were located at the opposite end of the grid. The transmission data obtained from the 3.4  $\mu\text{m}$  system were used to determine the extinction coefficient of the cloud.

e. Multichannel recorders were used to record the output of the receivers and telephotometer. The recordings also contained a synchronized timing signal.

### 2.3.6 Particle Size Analyzers

Three of DPG's particle size analyzers (PSA) were factory modified, for the following particle size ranges: 0.65 - 1.23; 1.23 - 2.3; 2.3 - 10.0; 10.0 - 15.0; 15.0 - 20.0; and > 20.0  $\mu\text{m}$ .

The PSA was positioned as shown in Figure 1, and was used with a 100:1 diluter.

### 2.3.7 Photographic

- a. Two remotely operated, battery powered, 35 mm cameras, operating at approximately 10 frames per second, were positioned (Figure 1) to obtain cloud dimensions (length, width, and height).
- b. The cameras were equipped with time code generators which were activated manually to record real time on the film.
- c. A stadia marker consisting of three 55 gallon drums, welded together, was positioned adjacent to the particle size analyzer (sampler grid center). The drums were painted, alternately, black and white.
- d. An additional 35 mm movie camera, without a time code generator was at the CP for documentary photo coverage.

### 2.3.8 Meteorological

A two meter meteorological mast instrumented for wind speed and direction was positioned approximately 15 meters south of the transmitters (Figure 1). The data were recorded on magnetic tape for later processing. Relative humidity and temperature data were taken at hourly intervals from the Fort Sill weather station or were recorded from instrumentation located at the DPG instrumentation van.

### 2.3.9 Soil Analysis

Soil samples were collected each firing day (16, 17 May) from a selected fresh shell crater. The sample was taken at a level within the crater approximately half way between the ground surface and the bottom of the crater. The samples were returned to DPG in sealed containers for moisture analysis.

The procedure was to place two grams of each of the samples into four weighing bottles (two samples x two bottles) for duplicate assays. The bottles were cleaned, dried, and tare weighed before the soil samples were placed into them. After soil samples were placed in the bottles, the bottles were weighed and placed in a vacuum oven (106°C, 21 in Hg) for one hour. After removal from the oven the bottles were placed in a desiccator overnight following which they were weighed. The results are reported in paragraph 2.4.4.

### 2.3.10 Calibration

With the exception of the PSA which had been factory calibrated, all instrumentation used for data acquisition, repair and maintenance was calibrated by DPG prior to use. Also, instrumentation used for data acquisition, not certified by DPG calibration facility, was verified as to its functional capability with current certified instrumentation.

### 2.3.11 Operation

a. The firing range was prepared to include installation of samplers and optical instrumentation. Target points (See Figure 1) for the munitions were selected based on the forecast of wind direction. Optical instruments were operated and calibrated as required prior to each day of operation.

b. All test data were recorded relative to time. All charts and tapes had the time data inserted using the Inter-Range Instrumentation Group Time (IRIG-B) System. Clocks were synchronized prior to each day's operation and verified prior to each trial.

c. An appropriate radio net was established to allow communication between the Test Officer, Fort Sill Operation Control Officer and other pertinent personnel.

d. The Test Officer made a final check prior to each firing to assure that (1) instrumentation was checked for proper operation, (2) samplers were in place, (3) meteorological conditions were acceptable, and (4) support facilities were ready. Munition impact on the grid was designated "Z-time". The Test Officer notified the Fort Sill Control Officer when all systems were ready. Munition impact location on the grid and meteorological data were recorded during each trial. Utilizing visual observation, the Test Officer announced the trial complete when, in his judgment, the dust cloud had passed and was no longer effective or present. All sampling and data recording was terminated in accordance with the schedule, and preparations were then made for the next trial.

## 2.4 RESULTS

### 2.4.1 Meteorological Data

Meteorological conditions prevailing during test conduct were satisfactory. Generally, all meteorological limitations listed in paragraph 2.3.2 were satisfied. Detailed wind speed and direction data are shown in the Summary of Test Day Data Tables, by trial, in Appendix B.

### 2.4.2 Dust Sampler Data

The 102 mm glassfiber pads were equilibrated to ambient humidity conditions and weighed before each trial and again weighed following exposure to the dust cloud. The weight differences (before and after) were converted to dust/debris recovery values, which were then converted into dosages. These data are shown graphically in Appendix B, pages B-2-3, B-3-3, B-4-3, B-5-3, B-10-3, B-14-3, B-15-3 and B-22-3. Tabular data are shown in Sections 1, 2, 3, 4, 9, 13, 14 and 21 in Volume 2 of this report.

Reference 1 requested limited dust sampling. Specifically (Reference 3), six vehicular movement trials were planned at each of two sites at Fort Sill. Additionally, two trials each day (for a total of six at each site) were to be sampled for dust. Actually accomplished were four preliminary trials (P1 - P4) and four trials (two on each of two days) in which dust/debris generated from exploding munitions was sampled (T7, T11, T12 and T19).

#### 2.4.3 Optical Instrumentation Data

Optical instrumentation data were collected as described in paragraph 2.3.5 and recorded as an analogue signal on magnetic tape. The analogue tapes were digitized for processing and the data were then reduced to transmittance values for 9.75  $\mu\text{m}$  (8 - 12  $\mu\text{m}$  band), 3.4  $\mu\text{m}$ , 1.06  $\mu\text{m}$  and 0.4 - 0.7  $\mu\text{m}$  wavelengths. Luminance values for the 1.06  $\mu\text{m}$  wavelength are also reported. Transmittances and luminances are presented graphically through time in Appendix B; tabular data are shown in Volume 2.

#### 2.4.4 Soil Analysis

The soil analysis was conducted as described in paragraph 2.3.9. Results of the moisture content assay are summarized as follows:

<u>Soil Sample</u>	<u>Moisture (%) by Weight</u>
16 May 1978	7.9
17 May 1978	3.5

Detailed data are shown in Appendix B, Table 2.

#### 2.4.5 Particle Size Analyzer Data

On 17 of the 24 trials, the PSA was encompassed by the dust cloud and for these trials, proportional distributions are presented in the Summary of Test Day Data tables in Appendix B. For seven of the 17 trials (P1 - P4, T3, T8, T20), data provided included number median diameter (NMD) in  $\mu\text{m}$ , the logarithm of NMD and the standard deviation of the logarithm of NMD; these were computed using Probit Analysis. For four of the trials (T10, T17, T19, T22), graphical estimates of the NMD are provided. For the remaining six trials, an upper bound to the NMD is provided. The number median diameters are summarized in Table 2.

Table 2. Number Median Diameter ( $\mu\text{m}$ ) by Trial.

<u>TRIAL</u>	<u>NUMBER MEDIAN DIAMETER (<math>\mu\text{m}</math>)</u>
P1	2.88
P2	2.86
P3	2.59
P4	2.81
T3	1.54
T8	1.23
T10	1.17*
T17	1.22*
T19	1.20*
T20	1.03
T22	1.23*

#### 2.4.6 Photographic Data

Cloud dimension data are shown in Appendix B, Tables 4 through 14, for trials T3, T8, T10, T12, T13, T14, T15, T16, T17, T19 and T20. These trials were selected by observing "quick-look" PSA data.

It should be noted that complete data are available for trials T12, T13, and T14. In trials T3, T8, and T10, the cloud was not sufficiently in the cameras field of view to provide all three dimensions. Commencing with trial 15 through to trial 20, one of the cameras malfunctioned and, therefore, measurements in only two dimensions are available for those trials.

### 2.5 ANALYSIS

#### 2.5.1 Analysis of Dust Sampler Data

The rationale for particle sampling was to develop extinction coefficients for airborne material produced by both vehicular movement and exploding munitions as described in Reference 4. As previously discussed, paragraph 2.4.2, dust sampling was accomplished on eight trials, four from vehicular movement and four from exploding munitions.

---

\*Graphical Estimates

Dust sampler data in the form of dosages from the preliminary trials P1 - P4 are shown in Appendix B, pages B-2-3, B-3-3, B-4-3 and B-5-3. The dosages demonstrate that the cloud was contained by the sampling line in each trial, but they are light, varying from 0.06 to 0.12 gm-min/m<sup>3</sup>.

Dosages estimated from those trials involving the exploding munitions were not clustered around grid center as well as in the dust trials. Consider trial T7 (Appendix B, page B-10-3). Because of the spread of the three impacting rounds, the dust cloud extended all along the sampling line. The peak dosage was 0.56 gm-min/m<sup>3</sup>. In trial T11 (Appendix B, page B-14-3) the cloud passed to the south end of the sampling line and may not have been contained on that end. It had a peak dosage of 0.24 gm-min/m<sup>3</sup>. The cloud in trial T12 was not solid (Appendix B, page B-15-3) and had a peak dosage of 0.18 gm-min/m<sup>3</sup>. The cloud in trial T19 (Appendix B, page B-22-3) was also fragmented, the heaviest dosage being in the center but smaller dosages were encountered at the extremities of the sampling line; the peak dosage was 0.20 gm-min/m<sup>3</sup>.

In summary, the dust clouds from the preliminary trials were well distributed although the dosages collected were light. The dust clouds from the exploding munition trials were poorly distributed but with dosages similar to those observed during the Smoke Week I test (0.18 to .24 gm-min/m<sup>3</sup>, Reference 5).

#### 2.5.2 Analysis of Transmittance Data

Measurements of transmittances were made for the 9.75, 3.4, 1.06 and 0.4 - 0.7  $\mu$ m wavelengths and are reported in Appendix B for each trial with the exception of trial 22 where signals from the transmissometer at 3.4  $\mu$ m did not record and hence data are not available. For the preliminary trials, P1 - P4, the transmittances for all wavelengths were similar, i.e., the reduction in transmittance was one order of magnitude or less. The transmittance curves also reflect the way the dust clouds were generated in that the transmittance values decline and rise cyclically, indicating several clouds passed the line of sight. The explanation resides in the fact that dust from vehicular movement was generated by a five-ton truck dragging chunks of scrap metal in a circular pattern adjacent to the sampling line. The extremities of the circular pattern varied from 10 to 35 meters from the sampling line.

For the trials involving the 155 mm projectiles (T3 - T11), it was noted that T3 was an extremely light cloud. Trial T5 shows two clouds, one being a heavy cloud caused by the initial two rounds and the other from the third round which impacted 15 seconds after the first two. Trial T3 involved a single round; trials T4 through T8 involved three rounds each, and trials T9 through T11 involved the firing of two rounds

each. For this series of tests, there appears to be a correlation between the number of rounds fired and the degree of reduction in the transmittance values for the infrared wavelengths.

The trials involving the 105 mm projectiles (T12 through T22) were all with single rounds, excepting T21 and T22. For the single round firings, the transmittance values varied in reduction from one to two orders of magnitude. There was in excess of a two log reduction for the transmittances at 1.06  $\mu\text{m}$  in T21 and T22 (multiple round trials).

### 2.5.3 Cloud Luminance

Cloud luminance data for 1.06  $\mu\text{m}$  are shown graphically in Appendix B and in tabulated detail in Volume 2. It is interesting to note that the peak cloud luminance (microwatts/cm<sup>2</sup>/steradian/nanometer) for the preliminary trials (P1 - P4) averaged 3.30 mw/cm<sup>2</sup>/sr/nm, and for the 155 mm trials, the peak cloud luminance varied from 3.20 (T3) to 4.60 (T4 and T6), these peak luminances being nearly equal. However, starting with T12 through T17 the peak cloud luminance dropped to an average of 0.50 mw/cm<sup>2</sup>/sr/nm averaged over T12 - T17). For T18 - T20, the peak luminance increased to an average of 1.35 mw/cm<sup>2</sup>/sr/nm. For T21 and T22, where there were multiple firings (4 and 5 rounds, respectively) the luminance increased to an average of 2.25 mw/cm<sup>2</sup>/sr/nm. However, since luminance is governed to a large extent by solar and sky brightness, little inference regarding the nature of the clouds can be derived from these data.

### 2.5.4 Particle Size Data

The anticipated particle size distributions (significant populations in the 5 - 20  $\mu\text{m}$  range) did not materialize, as was seen in Table 2, page 9. From Table 2, there can be seen a rather marked difference in the NMDs observed in the vehicular movement trials (average NMD 2.79  $\mu\text{m}$ ) and those observed in the explosive munition trials (average NMD 1.23  $\mu\text{m}$ ).

Several explanations could account for the difference. For one, dust generated was from different soil strata. Also, the explosive munitions may have deagglomerated the soil to the extent that the particle size distribution was different.

### 2.5.5 Calculation of Extinction Coefficient

Extinction coefficients can be calculated from the integral of the negative logarithm of the transmittance divided by the dosage of obscuring material integrated over the distance of the optical path, provided the time intervals for transmittance and dosage determinations correspond.

Extinction coefficients were estimated for seven Fort Sill trials. Tables 3 and 4 summarize extinction coefficients computed using data from trials with vehicular dust and with dust/debris generated with exploding munitions.

Table 3. Extinction Coefficients for Fort Sill Dust from Trials P1 - P4.

<u>Wavelength (<math>\lambda</math>, micrometers)</u>	<u>Extinction Coefficient (meters<sup>2</sup>/gm)</u>
0.4 - 0.7	0.24
1.06	0.19
3.4	0.16
9.750	0.13

Table 4. Extinction Coefficients for Explosive Munition from Trials T7, T12, and T19 Fort Sill Dust.

<u>Wavelength (<math>\lambda</math>, micrometers)</u>	<u>Extinction Coefficient (meters<sup>2</sup>/gm)</u>
0.4 - 0.7	0.06
1.06	0.05
3.4	0.04
9.750	0.03

Extinction coefficients for dust are similar to, but somewhat smaller than those obtained by explosion of TNT during the DPG Smoke Week I Dust Trials (Reference 5). For example, in that test series the extinction coefficient was 0.27 (m<sup>2</sup>/gm) for the visible range, larger than even the coefficient for vehicular dust at Fort Sill. The cause of the difference in coefficients must be sought in divergences of soil properties (chemical and/or physical).

#### 2.5.6 Integrated Concentrations

Extinction coefficients together with transmittance at 3.4  $\mu$ m, were used in the computation of integrated concentrations along a line of sight (CL values) as a function of time. The CL values are shown graphically in Appendix B and, in tabulated form, in Volume 2 of this report, with the exception of T22 where no transmittance data for 3.4  $\mu$ m were available.

It should be noted that dust samplers were not used in all trials with exploding munitions. Therefore, in trials where no specific dosage values were measured, an average extinction coefficient based on data from trials T7, T12 and T19 (0.041 m<sup>2</sup>/gm) was used to compute CL values.

Peak CL values observed for the vehicular dust trials, P1 - P4 varied from 9 gm/m<sup>2</sup> (P3) to 15 gm/m<sup>2</sup> (P4). The peak CL values obtained from exploding munition trials varied from 43 to 135 gm/m<sup>2</sup>. Peak CL values obtained during Smoke Week I (Reference 5) with TNT, ranged from 11 to 22 gm/m<sup>2</sup>, but generally involved different quantities of explosives.

#### 2.5.7 Computed Transmittance Curves

Previous experience has shown that heavy clouds of smoke will attenuate transmitted visible light down beyond the capability of measurement by test instrumentation. Analogous events occurred during trials T4 through T11, T13, T14, T18 and T20 through T22. For this reason, computed transmittance data for the range 0.4 - 0.7  $\mu$ m were provided for all trials. Missing segments of transmittance curves were computed using complete transmittance data at 1.06  $\mu$ m and appropriate ratios of extinction coefficients. These data are shown graphically in Appendix B and in tabular form in Volume 2.

#### 2.5.8 Photographic Data

To clarify the meaning of data on cloud dimensions, the following explanation is provided.

Generally, cloud dimensions consider only that portion of the cloud that is most dense, discounting any light edge or fringe effects. There is subjectivity in determining the dimensions of the photographically coherent portion of the cloud. However, this subjectivity is minimized by the use of experienced film readers.

Cloud length is the length of the photographically coherent cloud along the direction of cloud travel, discounting fringe or edge effects. While a source, say a smoke generator or HC canister, is still disseminating smoke, then cloud length is measured from the source to the forward edge of the cloud. As soon as the generator stops, or munition/submunition ceases generating (photographically) significant amounts of smoke, the upwind edge of the cloud length is free to move with the wind, and cloud length, then, is measured from the front to the back termini of the cloud, again discounting wisps of smoke at the fringes.

Cloud width (meters) is the maximum width of the cloud in a dimension normal to the direction of wind travel.

Cloud height is measured from the ground to the top of the cloud. This presupposes that the bottom of the cloud is in contact with the ground. In the event the cloud does rise from ground level, measurements will be of the cloud's vertical thickness and the data tables will be annotated to reflect this condition.

Cloud dimension data were taken from round impact until the centroid of the cloud reached the grid. Trials were selected for photographic data reduction on the basis of positive responses by the particle size analyzer, located at the center of the grid.

#### 2.3.7. Computed Transmittance Curves

Previous experience has shown that heavy clouds of smoke will attenuate transmitted light even beyond the capability of measurement by test instrumentation. Attenuation events occurred during trials 14 through 17, 19, 21, 22 and 23 through 25. For this reason, computed transmittance data for the range 0.4 - 0.5 m were provided for all trials. Missing segments of computed curves were computed using complete transmittance data at 0.35 m and appropriate ratios of extinction coefficients. These data are shown graphically in Appendix B and in tabular form in Volume 2.

#### 2.3.8. Photographic Data

To clarify the meaning of data on cloud dimensions, the following explanation is provided.

Generally, cloud dimensions consider only that portion of the cloud that is most dense, discounting any light edge or fringe effects. There is subjectivity in determining the extent of the photographically coherent portion of the cloud. However, this subjectivity is minimized by the use of extended film readers.

Cloud length is the length of the photographically coherent cloud along the direction of cloud travel. Discounting fringe or edge effects, while a source, say a smoke generator or a capacitor, is still discharging smoke, then cloud length is measured from the source to the forward edge of the cloud. As soon as the generator stops or until the discharging ceases, transmittance (photorecording) significant amounts of smoke, the forward edge of the cloud length is then to have with the cloud and cloud length, then it is measured from the light to the back, forward of the cloud, again discounting fringe or smoke at the forward.

Cloud width (height) is the maximum width of the cloud in a direction normal to the direction of cloud travel.

Cloud height is measured from the ground to the top of the cloud. This specification that the bottom of the cloud is in contact with the ground, in the event the cloud does not rest on ground level, means that it will be the cloud's vertical thickness and the data factor will be modified to reflect this condition.

APPENDIX B - TEST DATA

<u>Section</u>	<u>PAGE</u>
Section 1, Weapons Data, Moisture Content, Grid Coordinates and Cloud Dimension Data . . . . .	B-1-1
Section 2, Trial DPI-005-P1 Data . . . . .	B-2-1
Section 3, Trial DPI-005-P2 Data . . . . .	B-3-1
Section 4, Trial DPI-005-P3 Data . . . . .	B-4-1
Section 5, Trial DPI-005-P4 Data . . . . .	B-5-1
Section 6, Trial DPI-005-T3 Data . . . . .	B-6-1
Section 7, Trial DPI-005-T4 Data . . . . .	B-7-1
Section 8, Trial DPI-005-T5 Data . . . . .	B-8-1
Section 9, Trial DPI-005-T6 Data . . . . .	B-9-1
Section 10, Trial DPI-005-T7 Data . . . . .	B-10-1
Section 11, Trial DPI-005-T8 Data . . . . .	B-11-1
Section 12, Trial DPI-005-T9 Data . . . . .	B-12-1
Section 13, Trial DPI-005-T10 Data . . . . .	B-13-1
Section 14, Trial DPI-005-T11 Data . . . . .	B-14-1
Section 15, Trial DPI-005-T12 Data . . . . .	B-15-1
Section 16, Trial DPI-005-T13 Data . . . . .	B-16-1
Section 17, Trial DPI-005-T14 Data . . . . .	B-17-1
Section 18, Trial DPI-005-T15 Data . . . . .	B-18-1
Section 19, Trial DPI-005-T16 Data . . . . .	B-19-1
Section 20, Trial DPI-005-T17 Data . . . . .	B-20-1
Section 21, Trial DPI-005-T18 Data . . . . .	B-21-1
Section 22, Trial DPI-005-T19 Data . . . . .	B-22-1

Section

PAGE

Section 23, Trial DPI-005-T20 Data . . . . .	B-23-1
Section 24, Trial DPI-005-T21 Data . . . . .	B-24-1
Section 25, Trial DPI-005-T22 Data . . . . .	B-25-1

## APPENDIX B, SECTION 1

### CONTENTS

<u>PAGE</u>	
B-1-2	TABLE 1. WEAPONS INFORMATION
B-1-3	TABLE 2. DETAILS OF MOISTURE CONTENT ASSAY
B-1-4	TABLE 3. UNIVERSAL TRANSVERSE MERCATOR COORDINATES FOR GRID INSTRUMENTATION
B-1-5	TABLE 4. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T3
B-1-6	TABLE 5. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T8
B-1-7	TABLE 6. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T10
B-1-8	TABLE 7. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T12
B-1-9	TABLE 8. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T13
B-1-10	TABLE 9. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T14
B-1-11	TABLE 10. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T15
B-1-12	TABLE 11. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T16
B-1-13	TABLE 12. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T17
B-1-14	TABLE 13. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T19
B-1-15	TABLE 14. INITIAL CLOUD DIMENSIONS THROUGH TIME FOR TRIAL T20

Table 1. Weapons Information.

	TRIALS 3-11	TRIALS 12-22
Type of Weapon Used	M109A1	M102
Type of Projectile	M107	HE, M1
Type of Fuze	M557PD	M557PD
Propellant	Charge 4, Green Bag	Charge 5
Average Quadrant Elevation	380 mils	322 mils
Range	5800 meters	5800 meters

Table 2. Details of Moisture Content Assay

	SAMPLE NUMBER			
	1A	1B	2A	2B
Weight of Bottle (gms)	8.6647	8.1920	8.1864	9.1904
Weight of Bottle and Soil (gms)	10.5575	10.0105	10.5296	11.3127
Weight of Soil (gms)	1.8928	1.8185	2.3432	2.1223
Weight of Bottle and Soil after Drying (gms)	10.4110	9.8629	10.4427	11.2397
Weight of Moisture (gms)	0.1465	0.1476	0.0869	0.0730
Percent Moisture	7.7	8.1	3.7	3.4
Average Sample Weight (gms)	7.9		3.5	

Table 3 . Universal Transverse Mercator Coordinates for Grid Instrumentation

Instrumentation	East (meters)	North (meters)	Height (meters)
East Camera	527003.004	3836248.842	451.328
West Camera	526181.483	3836021.326	441.355
East Target	526936.593	3835742.012	444.979
West Target	526788.808	3835718.441	438.133
Transmitter	526889.505	3835570.530	441.389
Receiver	526714.816	3836662.886	461.5
Pylon	526867.932	3835730.405	441.810
Dust Sampler 8 and PSA	526863.486	3835730.108	441.511
Dust Sampler 1	526879.875	3835627.280	441.757
Dust Sampler 2	526877.640	3835641.304	441.210
Dust Sampler 3	526875.182	3835656.726	441.523
Dust Sampler 4	526872.881	3835671.166	441.496
Dust Sampler 5	526870.615	3835685.381	441.534
Dust Sampler 6	526868.201	3835700.527	442.090
Dust Sampler 7	526865.670	3835716.407	441.914
Dust Sampler 9	526861.233	3835744.248	441.489
Dust Sampler 10	526858.854	3835759.173	441.296
Dust Sampler 11	526856.529	3835773.762	441.122
Dust Sampler 12	526854.145	3835788.718	441.051
Dust Sampler 13	526851.809	3835803.376	441.007
Dust Sampler 14	526849.478	3835818.003	440.878
Dust Sampler 15	526847.094	3835832.959	440.677

Table 4 Initial Cloud Dimensions Through Time for Trial T-3.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
954:01	10	ND	3
954:01.1	13	ND	3
954:01.2	14	ND	3
954:01.3	15	ND	3
954:01.4	17	ND	4
954:01.5	17	ND	4
954:01.6	18	ND	4
954:01.7	19	ND	4
954:01.8	19	ND	4
954:01.9	19	ND	4
954:02	20	ND	5
954:03	22	ND	5
954:04	26	ND	6
954:05	30	ND	9
954:06	30	ND	10
954:07	30	ND	10
954:08	33	ND	11
954:09	35	ND	12
954:10	43	ND	13
954:11	48	ND	13

ND: Width of cloud not available. Cloud doesn't come into camera's field of view until 954:13.

Table 5. Initial Cloud Dimensions Through Time for Trial T-8.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
1229:00	8	ND	2
1229:00.1	9	ND	3
1229:00.2	11	ND	3
1229:00.3	12	ND	3
1229:00.4	13	ND	3
1229:00.5	14	ND	3
1229:00.6	14	ND	4
1229:00.7	19	ND	4
1229:00.8	19	ND	4
1229:00.9	19	ND	4
1229:01	21	ND	4
1229:01.1	21	ND	4
1229:01.2	22	ND	5
1229:01.3	22	ND	5
*1229:01.4	32	ND	5
1229:01.5	35	ND	5
1229:01.6	35	ND	6
1229:01.7	36	ND	6
1229:01.8	36	ND	6
1229:01.9	36	ND	6
1229:02	36	ND	6
1229:03	39	ND	8
1229:04	45	ND	9
1229:05	50	ND	9
1229:06	54	ND	10
1229:07	56	13	11
1229:08	58	13	13
1229:09	65	16	14

ND: Width of cloud not available. Cloud doesn't come into camera's field of view until 1229:08.

\* Second impact occurs at 1229:01.4.

Table 6. Initial Cloud Dimensions Through Time for Trial T-10.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
1307:02	ND	9	2
1307:02.1	ND	11	2
1307:02.2	ND	12	2
*1307:02.3	ND	22	3
1307:02.4	ND	24	3
1307:02.5	ND	25	3
1307:02.6	ND	26	4
1307:02.7	ND	26	4
1307:02.8	ND	27	4
1307:02.9	ND	27	4
1307:03	ND	28	4
1307:04	ND	30	6
1307:05	ND	33	9
1307:06	ND	35	10
1307:07	ND	35	11
1307:08	ND	36	13
1307:09	ND	37	16
1307:10	ND	37	18
1307:11	ND	39	19
1307:12	ND	41	22
1307:13	ND	43	23
1307:14	ND	44	25
1307:15	ND	48	26
1307:16	ND	52	26
1307:17	ND	56	28
1307:18	ND	58	29

ND: Length of cloud not available. Cloud does not travel completely into camera's field of view.

\* Second impact occurs at 1307:02.3.

Table 7. Initial Cloud Dimensions Through Time for Trial T-12.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
921:00	4	4	2
921:00.1	4	9	3
921:00.2	7	9	3
921:00.3	7	11	3
921:00.4	8	11	3
921:00.5	8	11	4
921:00.6	8	11	4
921:00.7	9	12	4
921:00.8	10	12	5
921:00.9	10	12	6
921:01	11	12	6
921:02	15	16	7
921:03	17	18	8
921:04	17	22	9
921:05	18	23	9
921:06	18	25	9
921:07	19	25	10
921:08	21	33	12
921:09	21	36	12
921:10	23	37	12
921:11	26	39	11
921:12	36	ND	11
921:13	42	ND	11
921:14	42	ND	10
921:15	42	ND	10

ND: Width of cloud not available. Camera stopped at 921:11.

Table 8. Initial Cloud Dimensions Through Time for Trial T-13.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
927:02	1	2	1
927:02.1	3	10	2
927:02.2	5	12	2
927:02.3	7	13	3
927:02.4	7	14	3
927:02.5	8	14	3
927:02.6	8	15	3
927:02.7	8	15	4
927:02.8	8	15	4
927:02.9	9	17	4
927:03	9	17	4
927:04	11	22	6
927:05	13	29	7
927:06	15	32	8
927:07	19	32	9
927:08	21	35	9
927:09	26	39	10

Table 9. Initial Cloud Dimensions Through Time for Trial T-14.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
934:00	2	6	1
934:00.1	3	10	2
934:00.2	4	11	2
934:00.3	7	12	2
934:00.4	7	12	3
934:00.5	8	13	3
934:00.6	10	14	3
934:00.7	10	15	3
934:00.8	10	15	3
934:00.9	10	15	3
934:01	10	16	3
934:02	13	19	5
934:03	15	24	5
934:04	15	28	7
934:05	16	32	7
934:06	17	35	7

Table 10. Initial Cloud Dimensions Through Time for Trial T-15.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
957:59	ND	2	2
957:59.1	ND	4	3
957:59.2	ND	4	3
957:59.3	ND	4	4
957:59.4	ND	5	5
957:59.5	ND	5	5
957:59.6	ND	5	5
957:59.7	ND	5	5
957:59.8	ND	5	5
957:59.9	ND	5	5
958:00	ND	6	5
958:01	ND	8	6
958:02	ND	10	7
958:03	ND	11	7
958:04	ND	13	9
958:05	ND	16	10
958:06	ND	16	10
958:07	ND	18	10
958:08	ND	19	11
958:09	ND	20	12
958:10	ND	20	13
958:11	ND	20	13
958:12	ND	21	14
958:13	ND	23	15
958:14	ND	23	15

ND: Length of cloud not available. Camera did not run.

Table 11. Initial Cloud Dimensions Through Time for Trial T-16.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
1004:01	ND	2	3
1004:01.1	ND	3	3
1004:01.2	ND	3	3
1004:01.3	ND	5	3
1004:01.4	ND	5	3
1004:01.5	ND	6	3
1004:01.6	ND	7	3
1004:01.7	ND	7	3
1004:01.8	ND	7	3
1004:01.9	ND	7	3
1004:02	ND	7	4
1004:03	ND	8	5
1004:04	ND	10	6
1004:05	ND	13	7
1004:06	ND	18	7
1004:07	ND	19	7
1004:08	ND	23	7
1004:09	ND	23	7
1004:10	ND	23	7
1004:11	ND	23	7
1004:12	ND	28	8
1004:13	ND	28	9
1004:14	ND	28	10
1004:15	ND	29	10
1004:16	ND	31	11
1004:17	ND	31	11
1004:18	ND	31	13

ND: Length of cloud not available. Camera did not run.

Table 12. Initial Cloud Dimensions Through Time for Trial T-17.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
1010:01	ND	3	4
1010:01.1	ND	4	4
1010:01.2	ND	5	4
1010:01.3	ND	6	4
1010:01.4	ND	6	4
1010:01.5	ND	7	4
1010:01.6	ND	7	4
1010:01.7	ND	8	4
1010:01.8	ND	8	4
1010:01.9	ND	8	4
1010:02	ND	8	4
1010:03	ND	11	6
1010:04	ND	12	7
1010:05	ND	12	8
1010:06	ND	13	9
1010:07	ND	15	10
1010:08	ND	17	11
1010:09	ND	19	11
1010:10	ND	19	12
1010:11	ND	23	13
1010:12	ND	23	13
1010:13	ND	24	14
1010:14	ND	26	15
1010:15	ND	26	15
1010:16	ND	26	16
1010:17	ND	28	18

ND: Length of cloud not available. Camera did not run.

Table 13. Initial Cloud Dimensions Through Time for Trial T-19.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
1141:00	ND	5	1
1141:00.1	ND	7	2
1141:00.2	ND	8	2
1141:00.3	ND	8	2
1141:00.4	ND	9	2
1141:00.5	ND	9	3
1141:00.6	ND	10	3
1141:00.7	ND	10	3
1141:00.8	ND	10	3
1141:00.9	ND	10	3
1141:01	ND	10	3
1141:02	ND	13	3
1141:03	ND	15	3
1141:04	ND	15	5
1141:05	ND	16	6
1141:06	ND	18	6
1141:07	ND	19	7
1141:08	ND	19	7
1141:09	ND	23	8
1141:10	ND	23	8

ND: Length of cloud not available. Camera did not run.

Table 14. Initial Cloud Dimensions Through Time for Trial T-20.

TIME	LENGTH (meters)	WIDTH (meters)	HEIGHT (meters)
1148:00	ND	6	2
1148:00.1	ND	6	2
1148:00.2	ND	6	2
1148:00.3	ND	8	2
1148:00.4	ND	10	2
1148:00.5	ND	11	2
1148:00.6	ND	11	2
1148:00.7	ND	12	3
1148:00.8	ND	12	3
1148:00.9	ND	12	3
1148:01	ND	15	3
1148:02	ND	15	3
1148:03	ND	15	5
1148:04	ND	16	5
1148:05	ND	18	6
1148:06	ND	19	8

ND: Length of cloud not available. Camera did not run.

APPENDIX B, SECTION 2

CONTENTS

TRIAL DPI-005-P1 (DUST) 14 MAY 1978

<u>PAGE</u>	
B-2-2	TABLE OF TEST DAY DATA
B-2-3	FIGURE: DOSAGE BY SAMPLING POSITION
B-2-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-2-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-2-6	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-2-7	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-2-8	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-2-9	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-2-10	FIGURE: CL VALUES VERSUS TIME

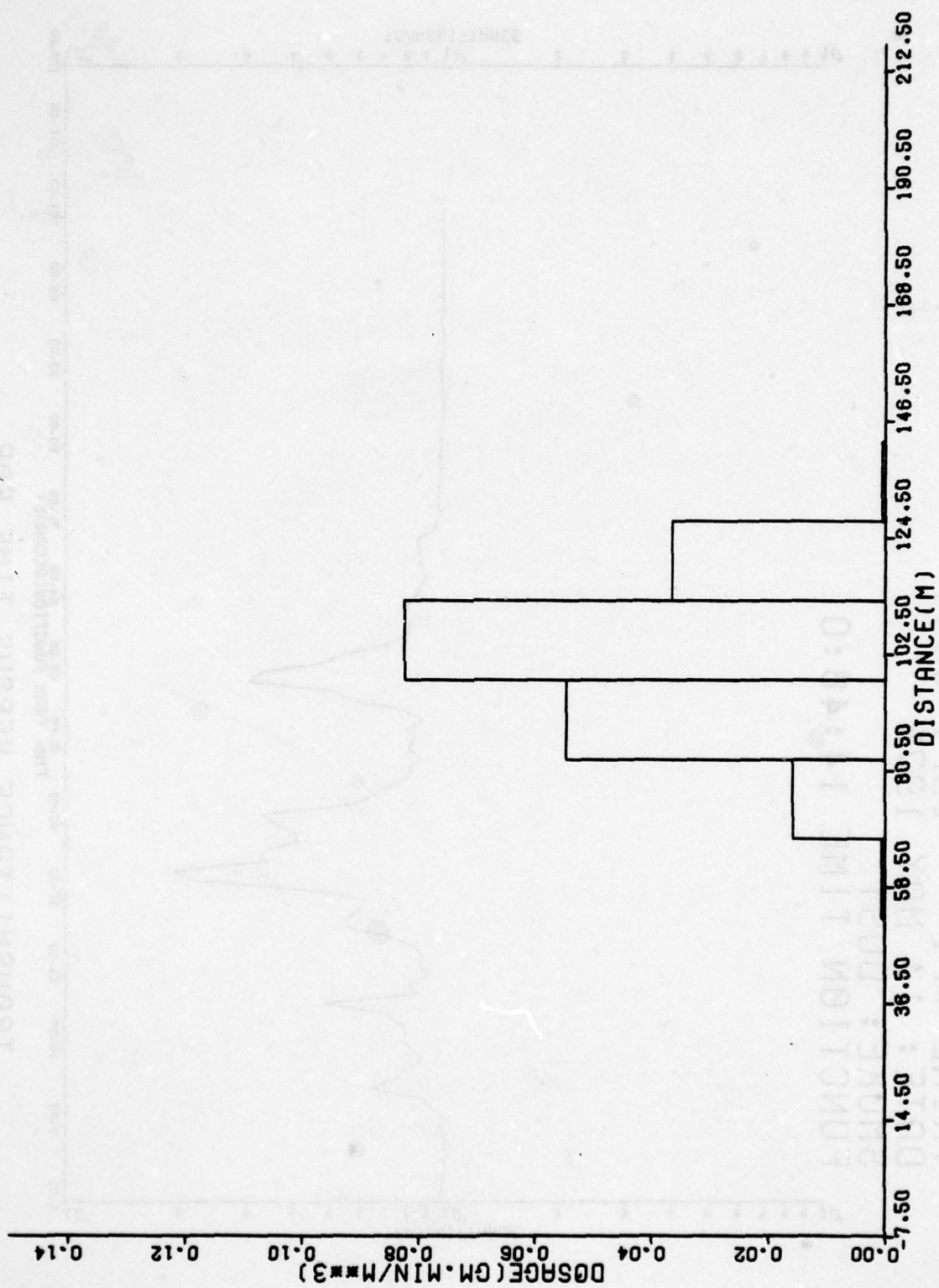
# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-P1

DATE: 14 May 1978

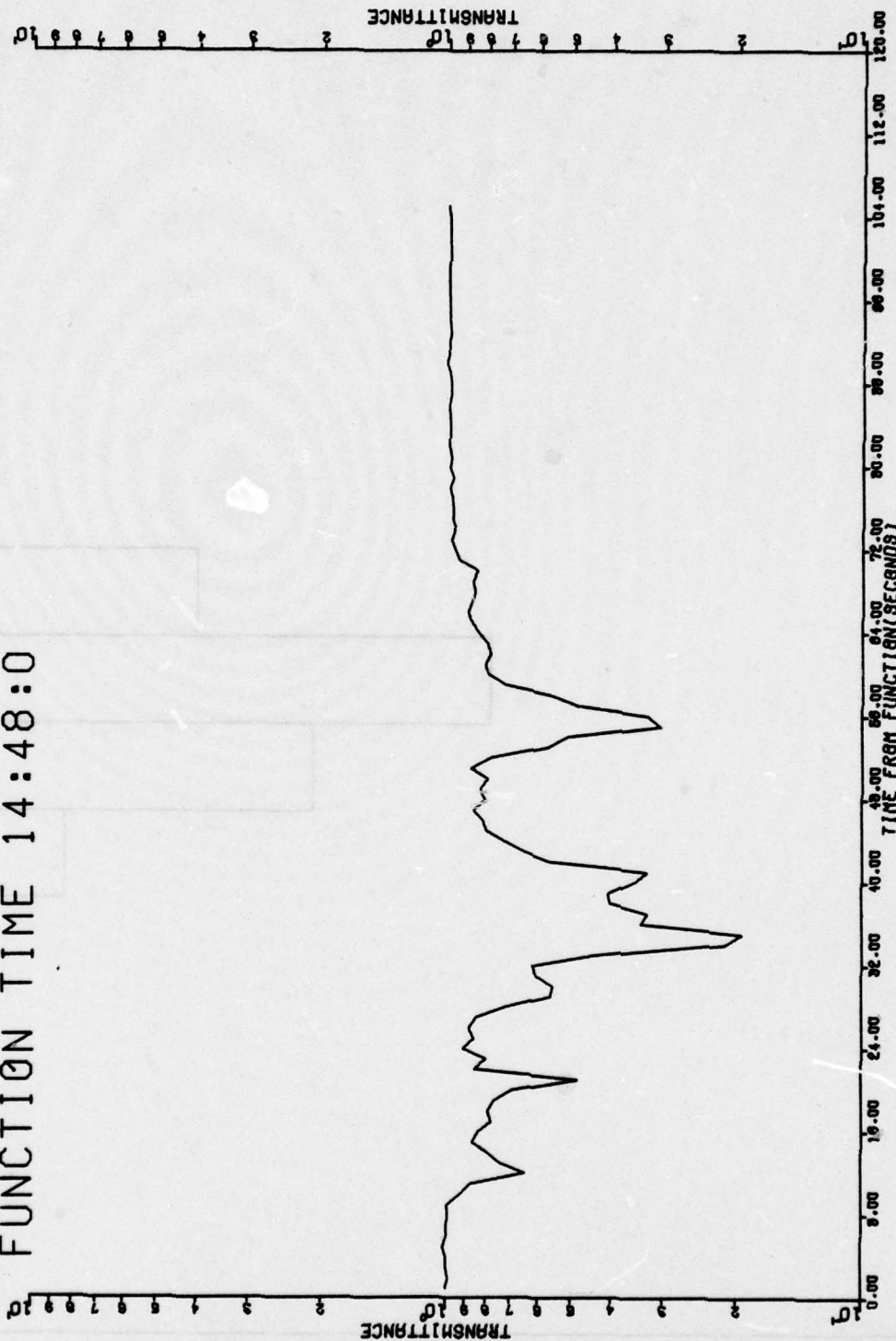
TIME: 1448

Wind Direction, degrees (2 meter) . . . . .	248
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	4.2
Relative Humidity, percent (2 meter) . . . . .	29
Temperature . . . . .	91°
Sky Conditions . . . . .	clear
Type of Munition . . . . .	NA
Number of Munitions . . . . .	NA
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.12
1.3 - 2.3 . . . . .	0.17
2.3 - 10.0 . . . . .	0.69
10.0 - 15.0 . . . . .	0.01
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
Log <sub>10</sub> NMD . . . . .	0.459
$\sigma_{\log_{10}}$ NMD . . . . .	0.259
NMD ( $\mu\text{m}$ ) . . . . .	2.88



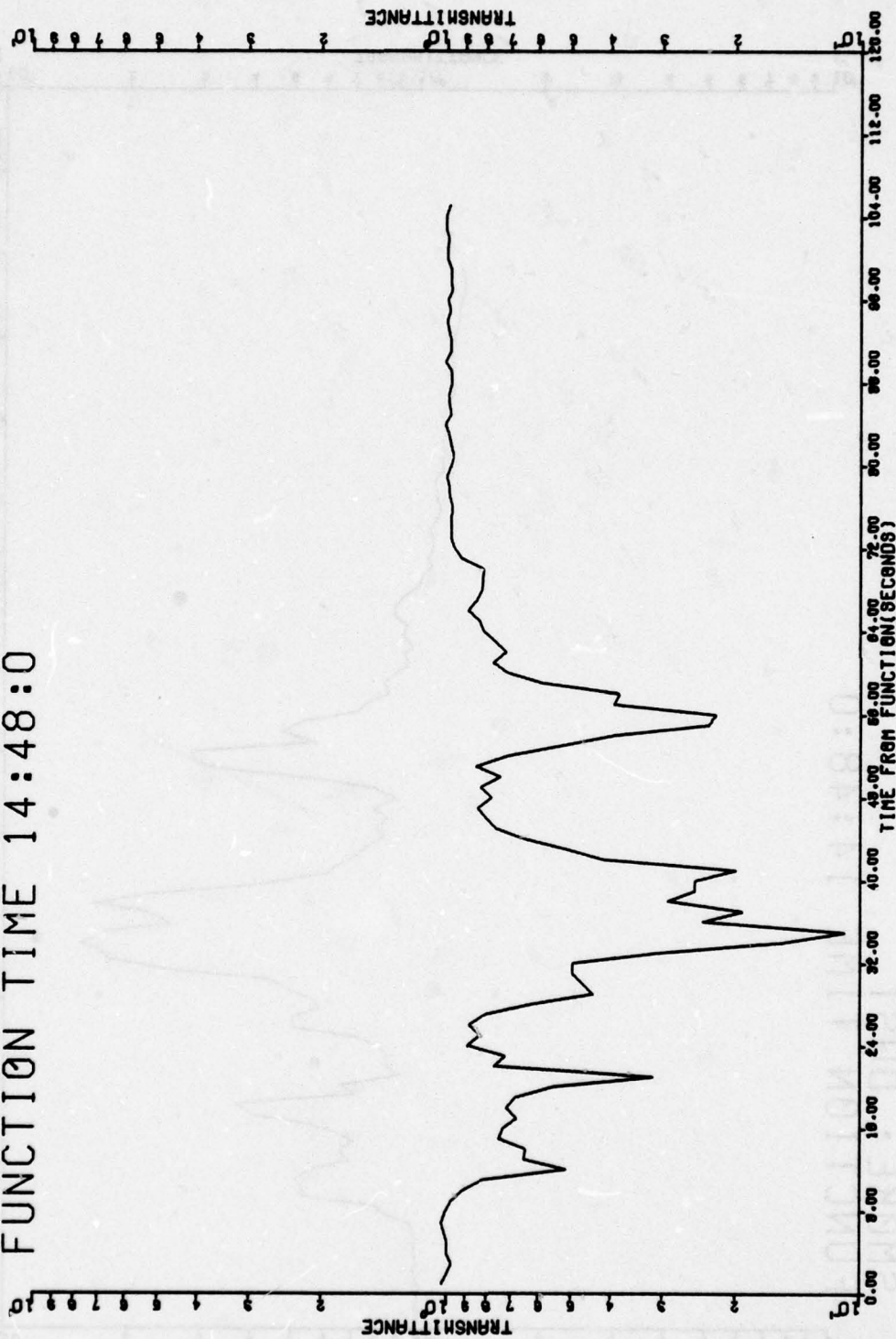
TRIAL P1, FT. SILL TESTS, 14 MAY 78, 14:48:00, DUST

TRIAL #P1 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 14:48:0



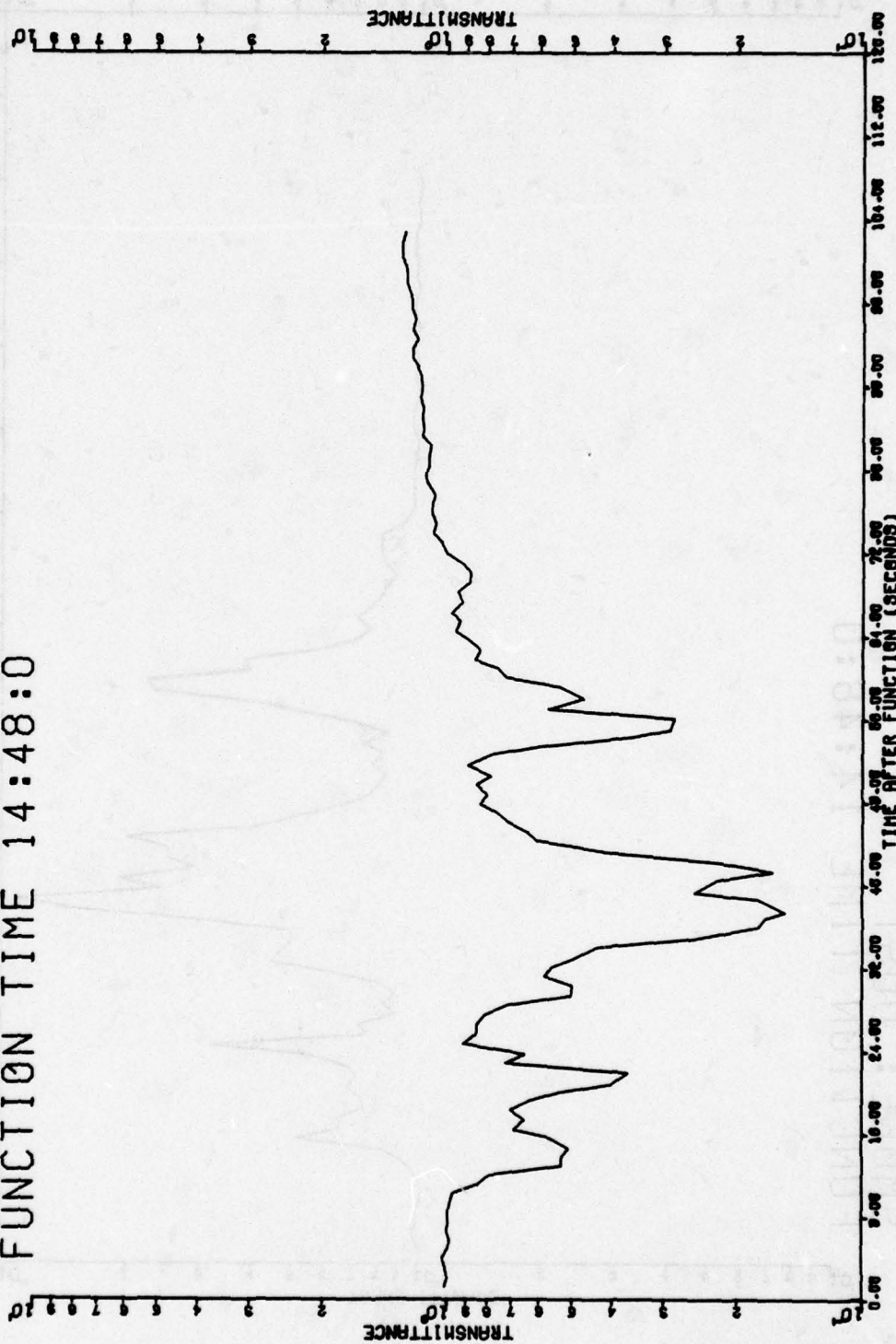
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #P1 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 14:48:0



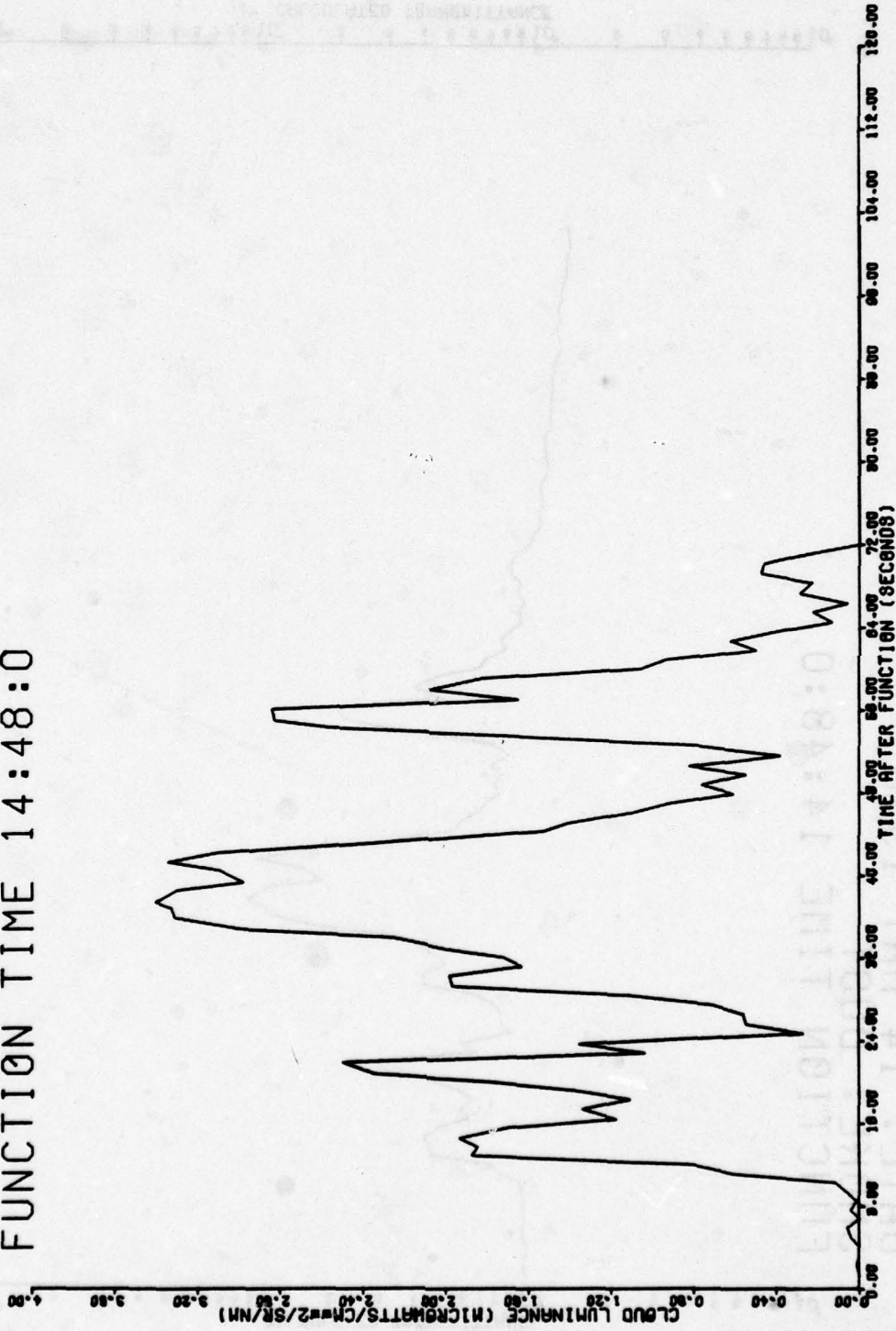
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #P1 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 14:48:0



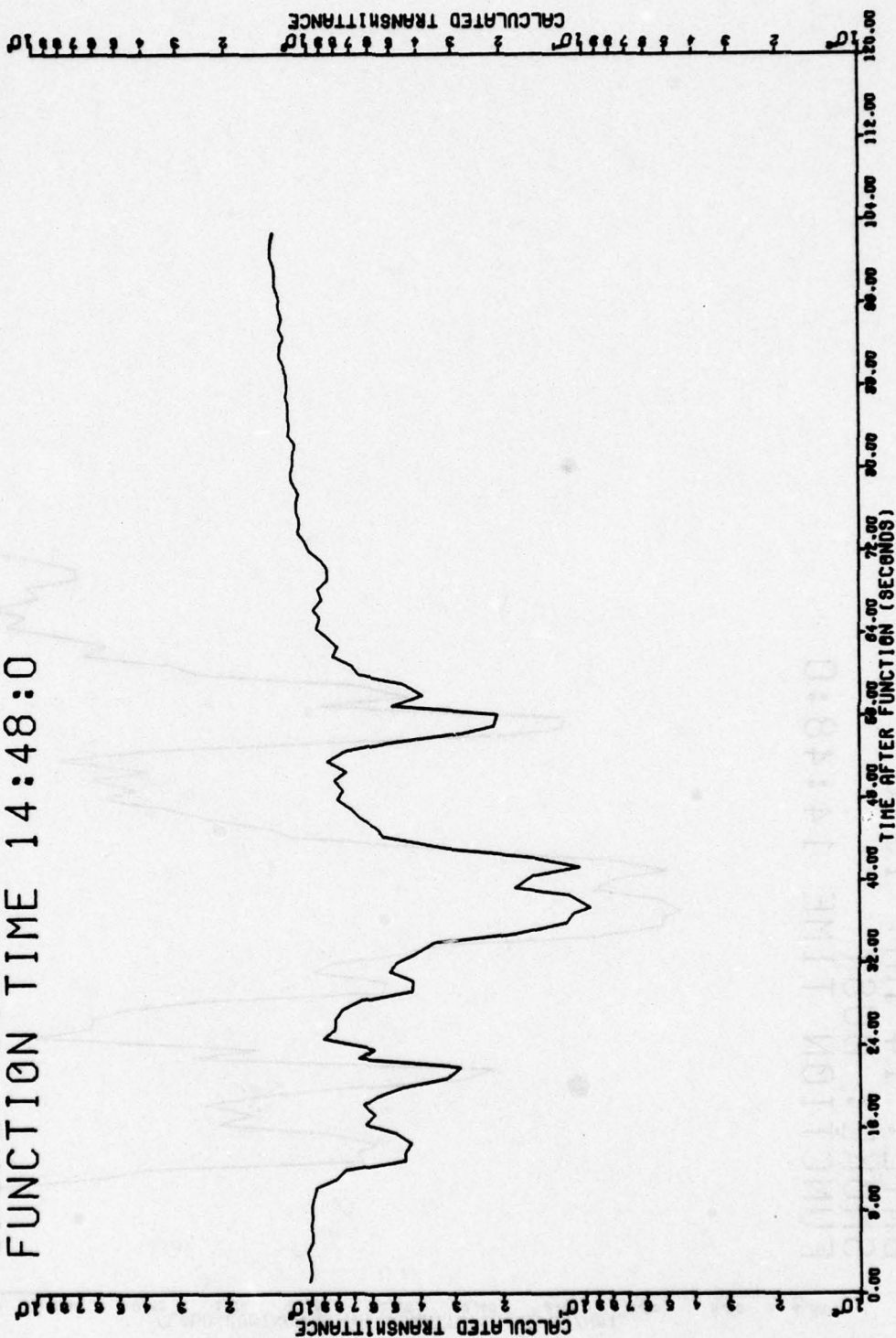
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #P1 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 14:48:0



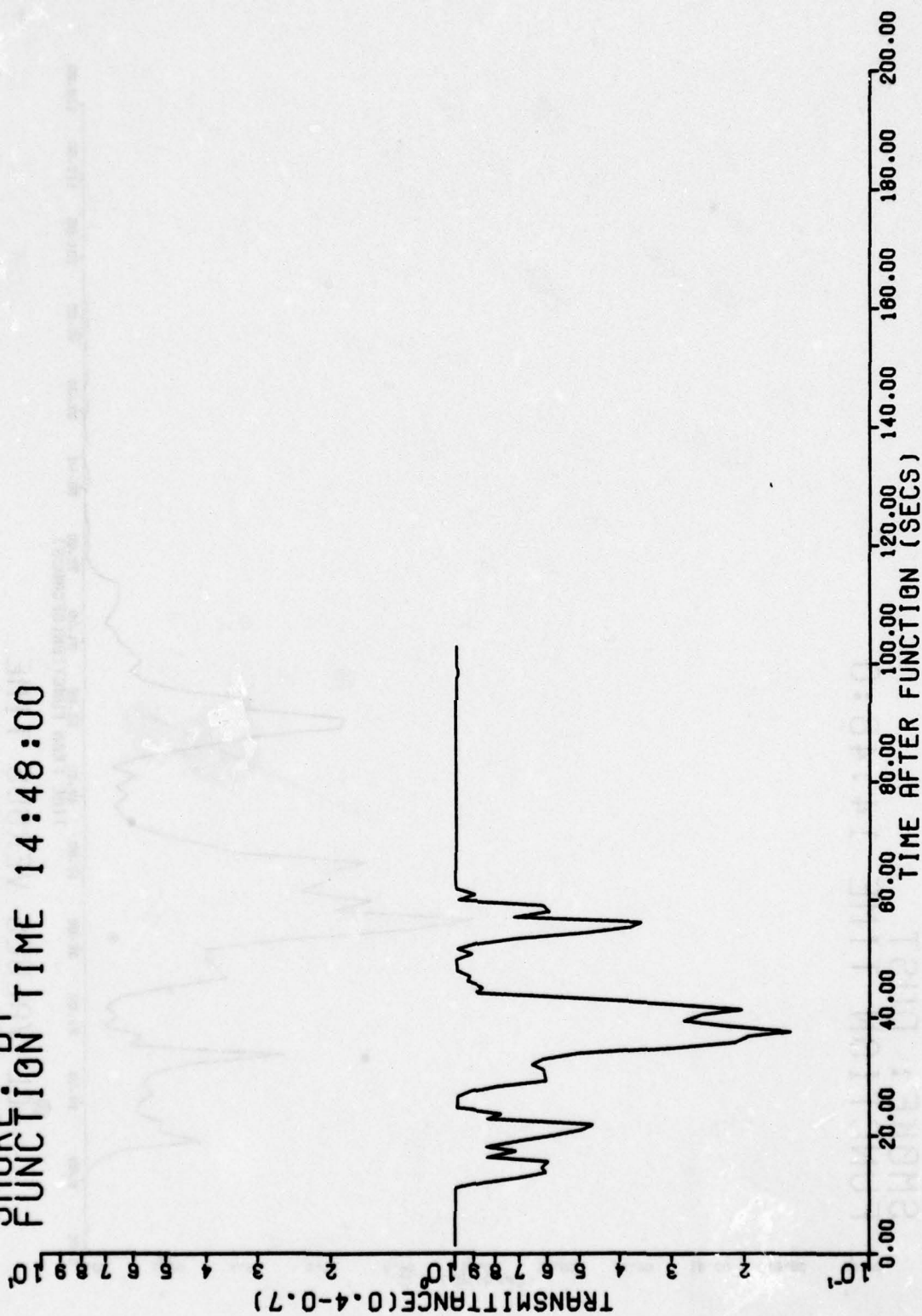
CLLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #P1 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 14:48:0



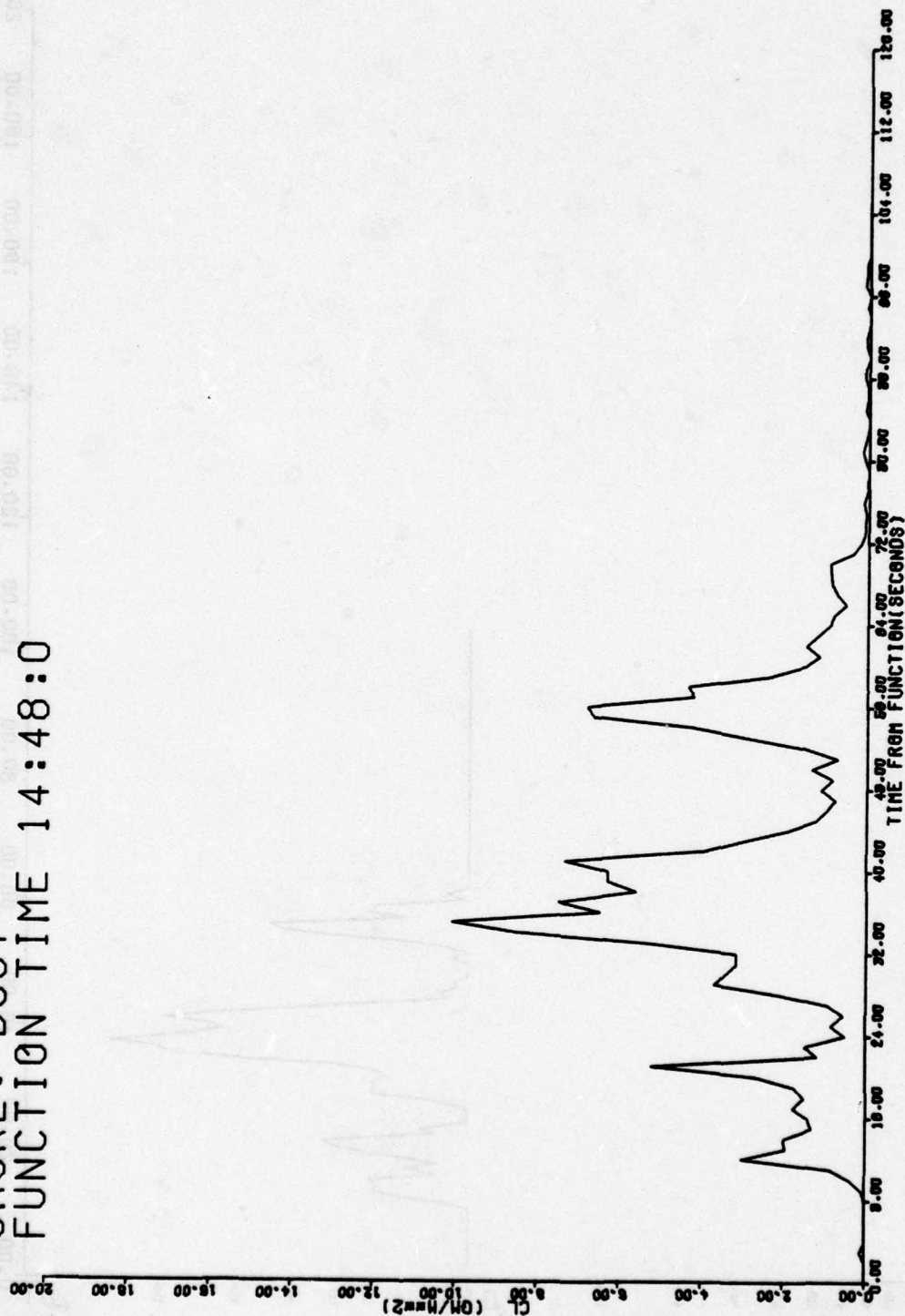
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL P1: FT: SILL TESTS  
DATE: 14 MAY 1978  
SMOKE: DT  
FUNCTION TIME 14:48:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #P1 [DP1-005]  
 DATE: 14 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 14:48:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 3

CONTENTS

TRIAL DPI-005-P2 (DUST) 14 MAY 1978

PAGE

B-3-2

TABLE OF TEST DAY DATA

B-3-3

FIGURE: DOSAGE BY SAMPLING POSITION

B-3-4

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
9.750  $\mu\text{m}$

B-3-5

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
3.443  $\mu\text{m}$

B-3-6

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-3-7

FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-3-8

FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7  $\mu\text{m}$

B-3-9

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
BETWEEN 0.4 AND 0.7  $\mu\text{m}$

B-3-10

FIGURE: CL VALUES VERSUS TIME

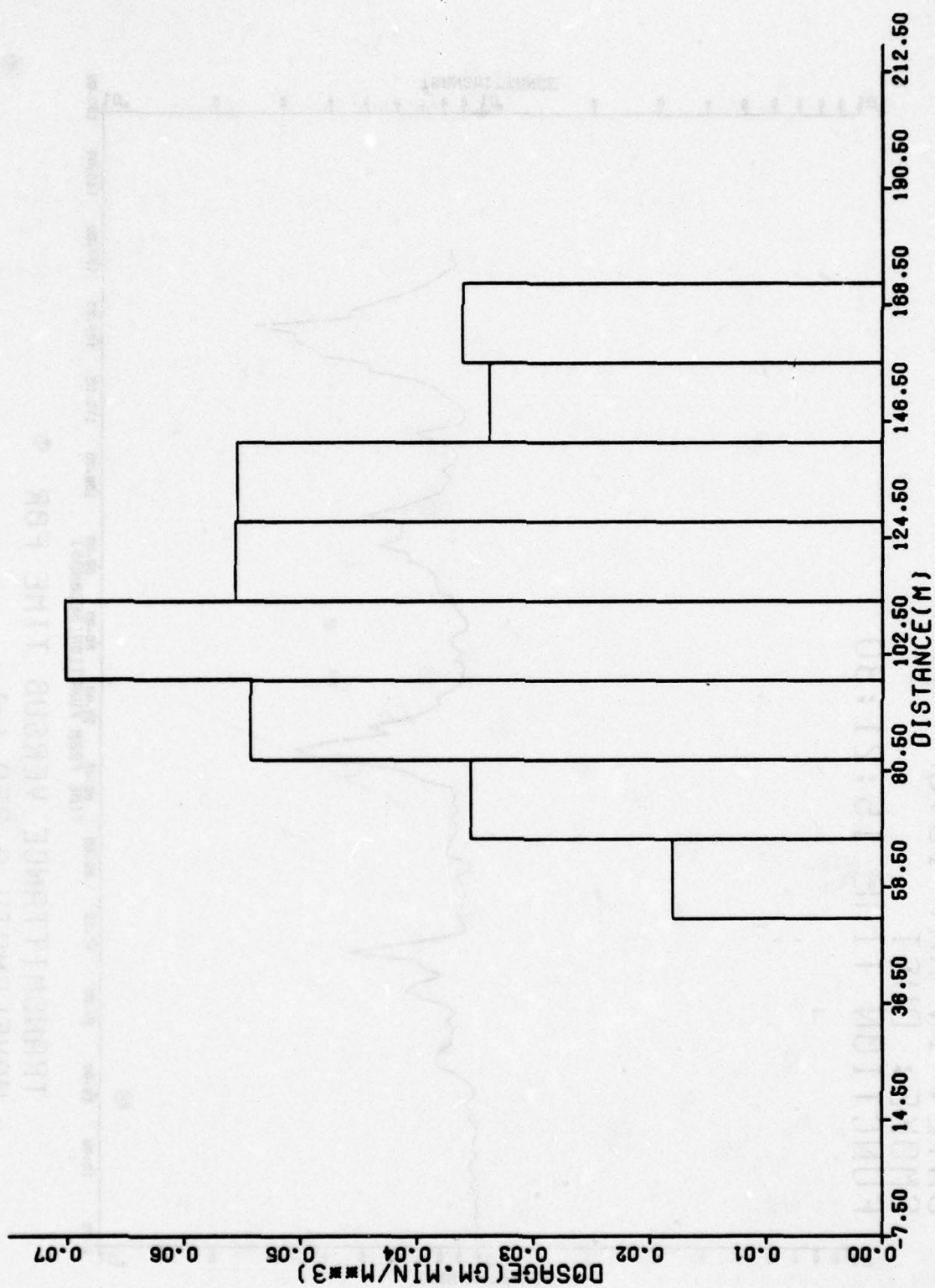
# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-P2

DATE: 14 May 1978

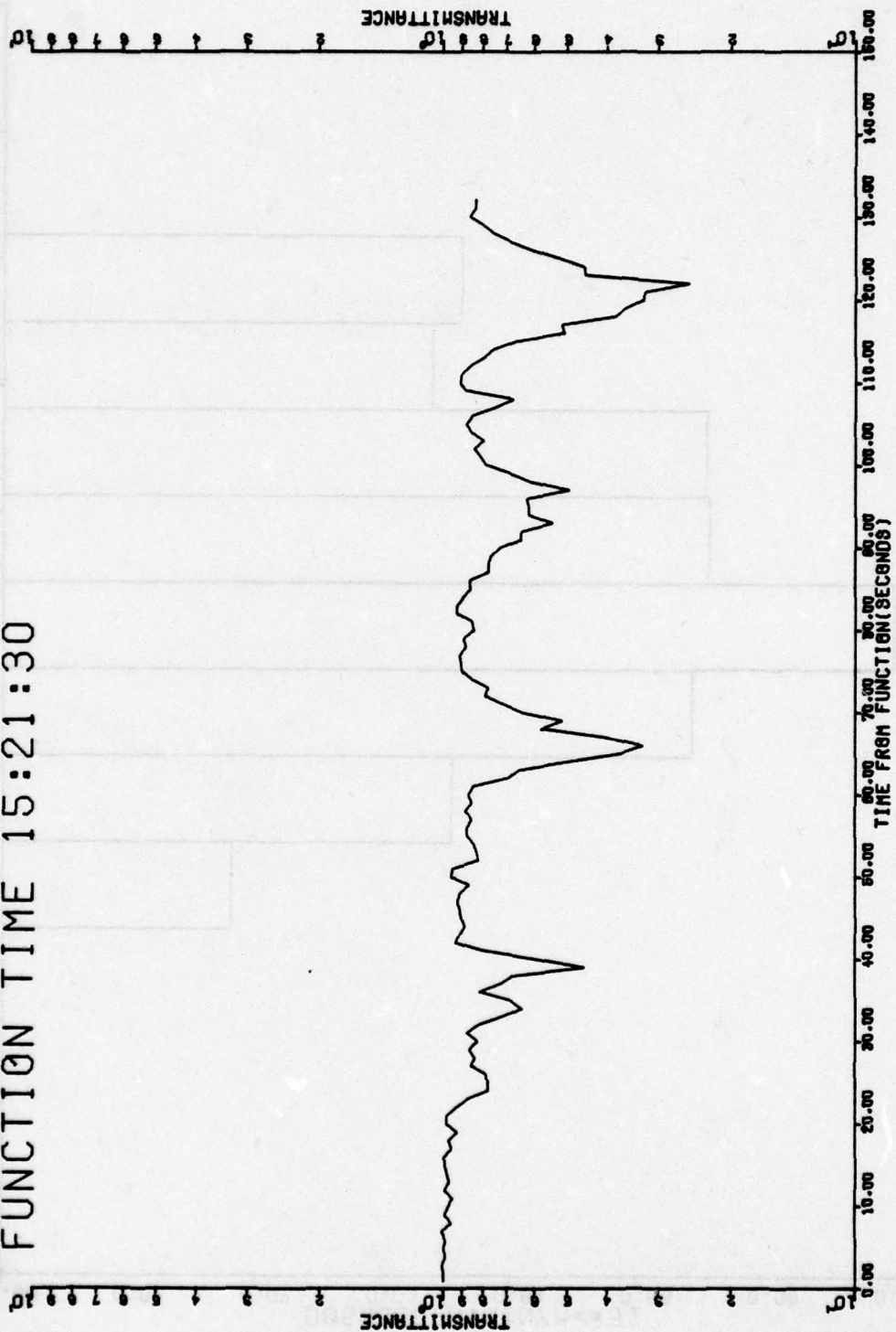
TIME: 1521

Wind Direction, degrees (2 meter) . . . . .	204
Wind Speed, U, meters/second (2 meter). . . . .	5.9
Relative Humidity, percent (2 meter) . . . . .	29
Temperature . . . . .	91°
Sky Conditions . . . . .	clear
Type of Munition . . . . .	NA
Number of Munitions . . . . .	NA
Particle Size Range (μm)	Proportion
0.65 - 1.3 . . . . .	0.14
1.3 - 2.3 . . . . .	0.19
2.3 - 10.0 . . . . .	0.66
10.0 - 15.0 . . . . .	0.02
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
Log <sub>10</sub> NMD . . . . .	0.456
σlog <sub>10</sub> NMD . . . . .	0.281
NMD (μm) . . . . .	2.86



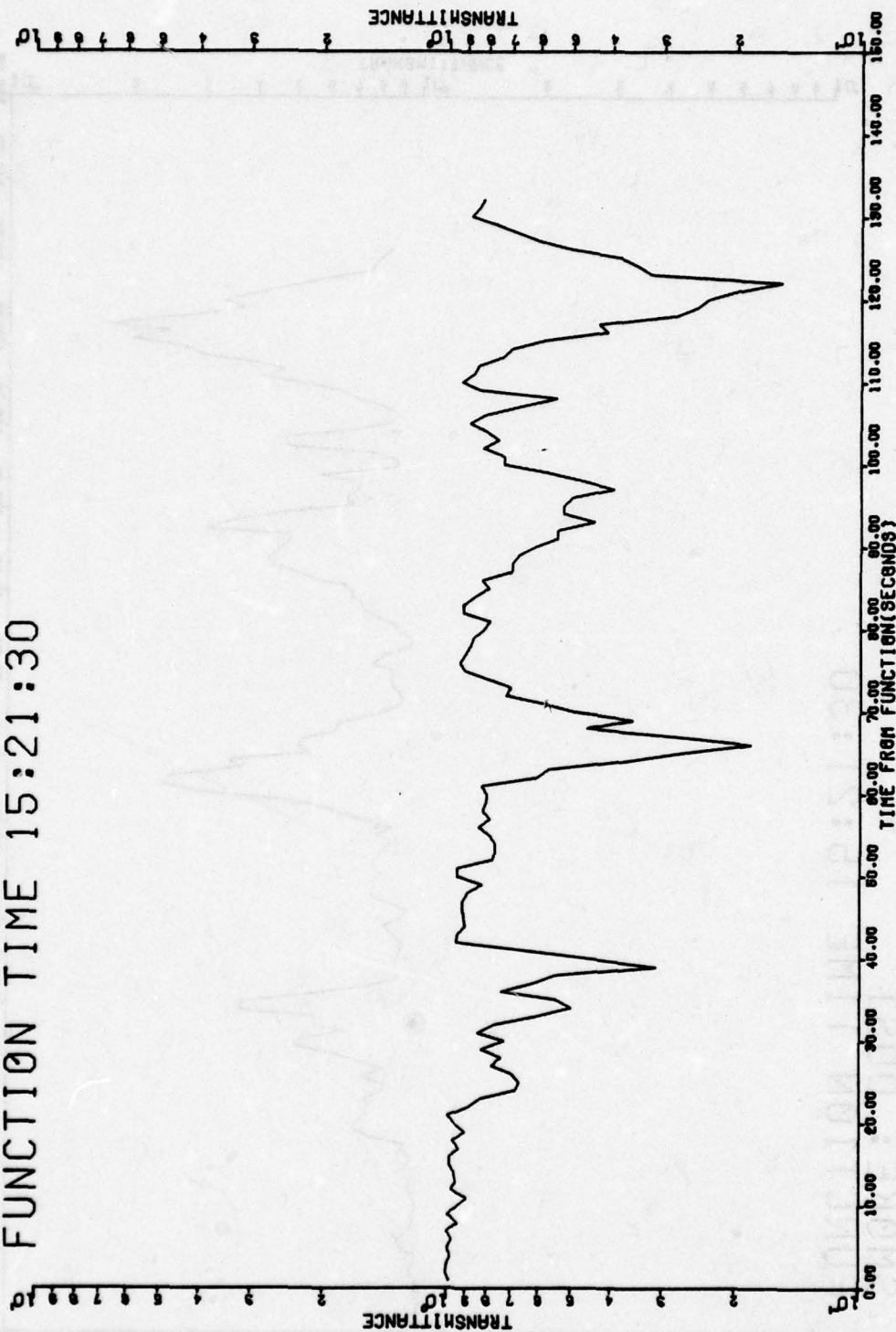
TRIAL P2, FT. SILL TESTS, 14 MAY 78, 15:21:30, DUST

TRIAL #P2 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:21:30



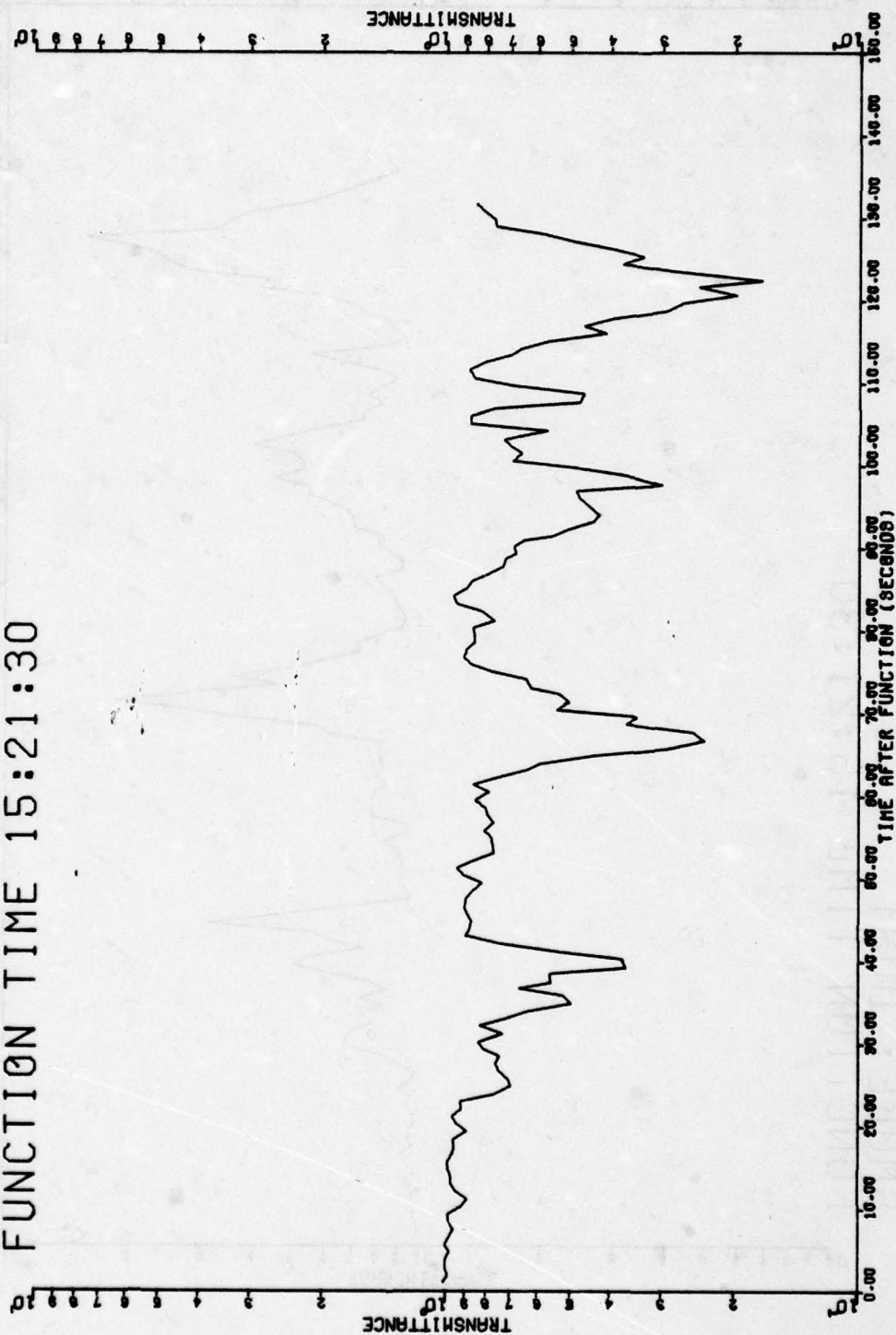
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #P2 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:21:30



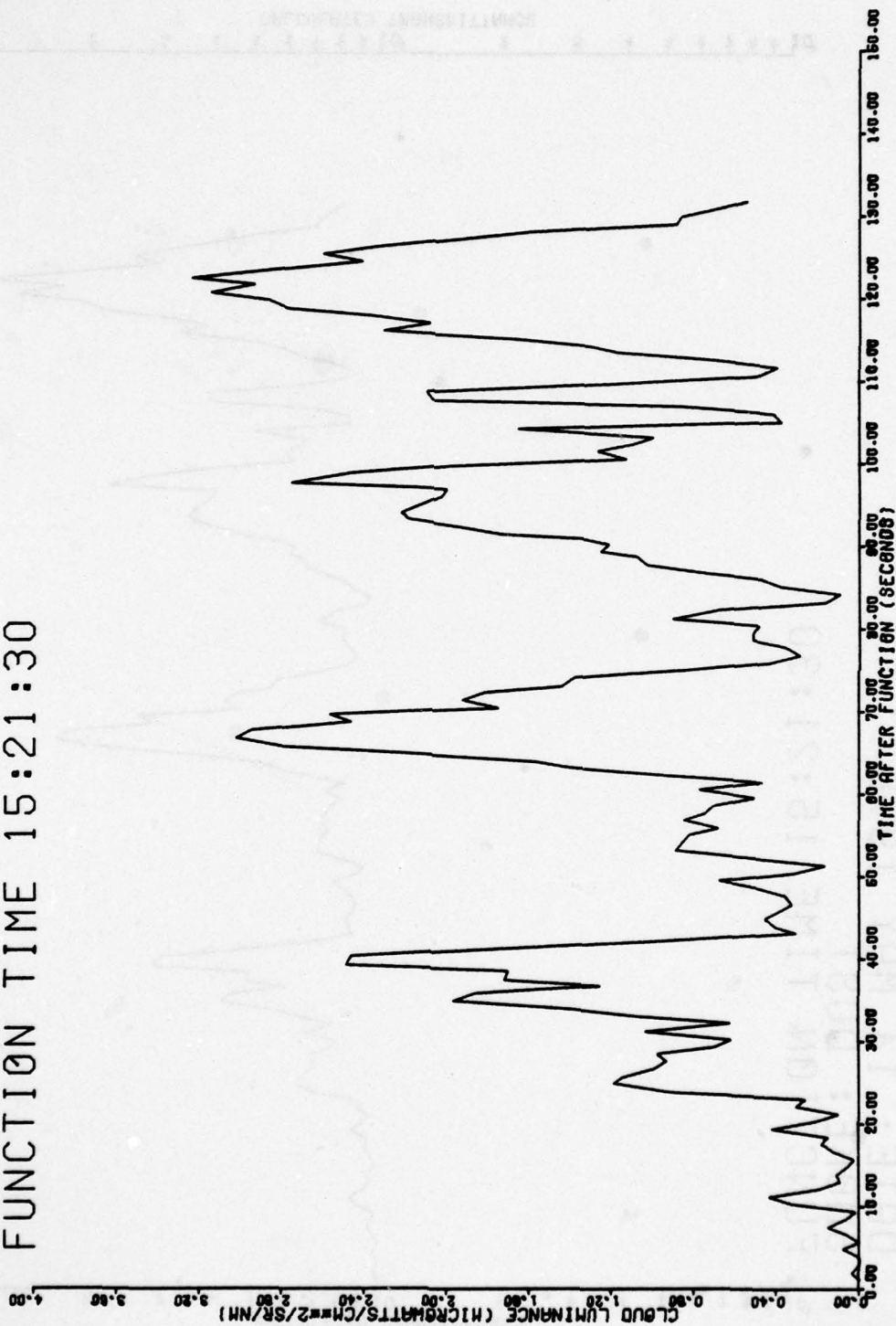
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #P2 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:21:30



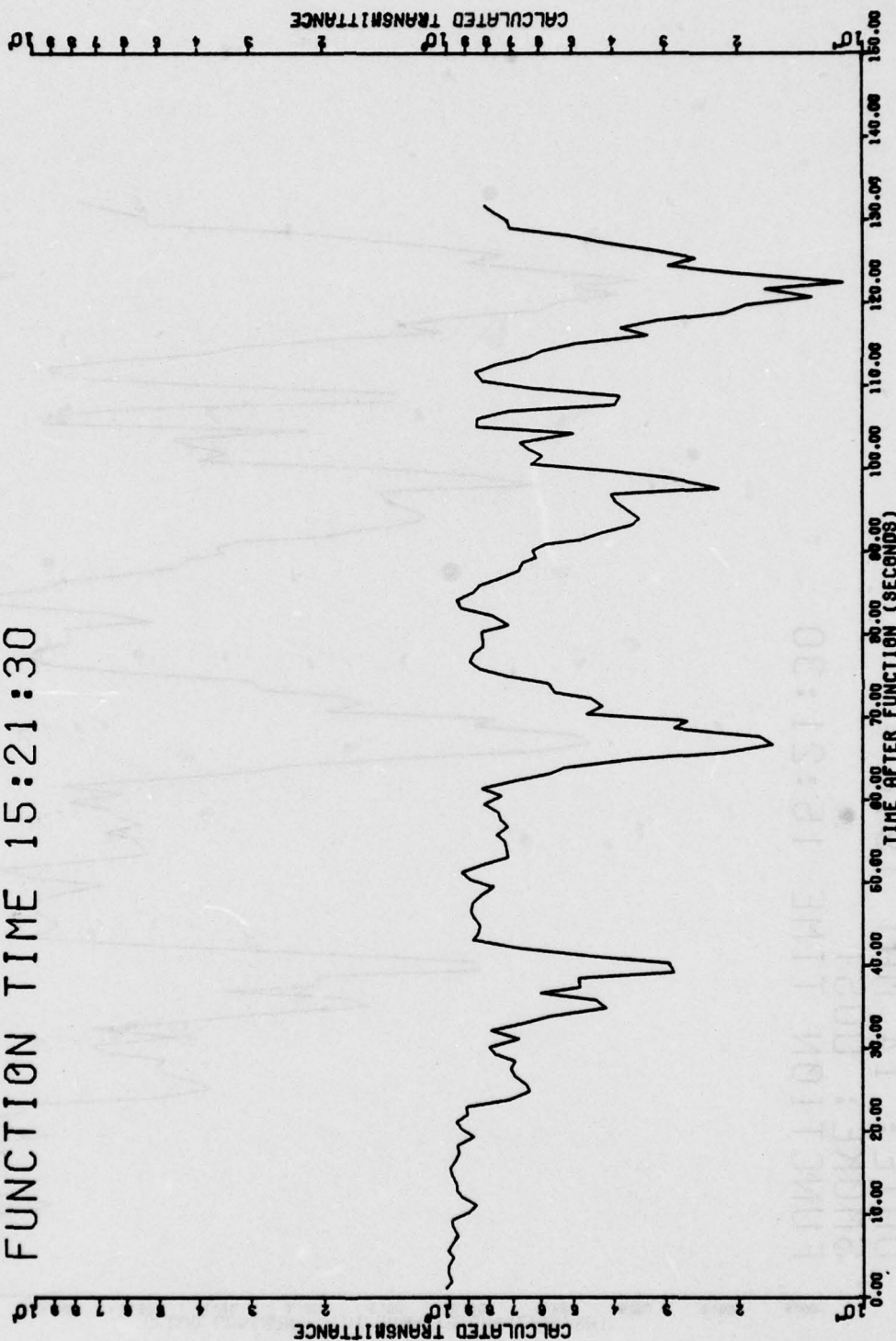
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #P2 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:21:30



CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #P2 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:21:30



CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 (μm)

TRIAL P2: FT. SILL TESTS  
DATE: 14 MAY 1978  
SMOKE: DT  
FUNCTION TIME 15:21:30

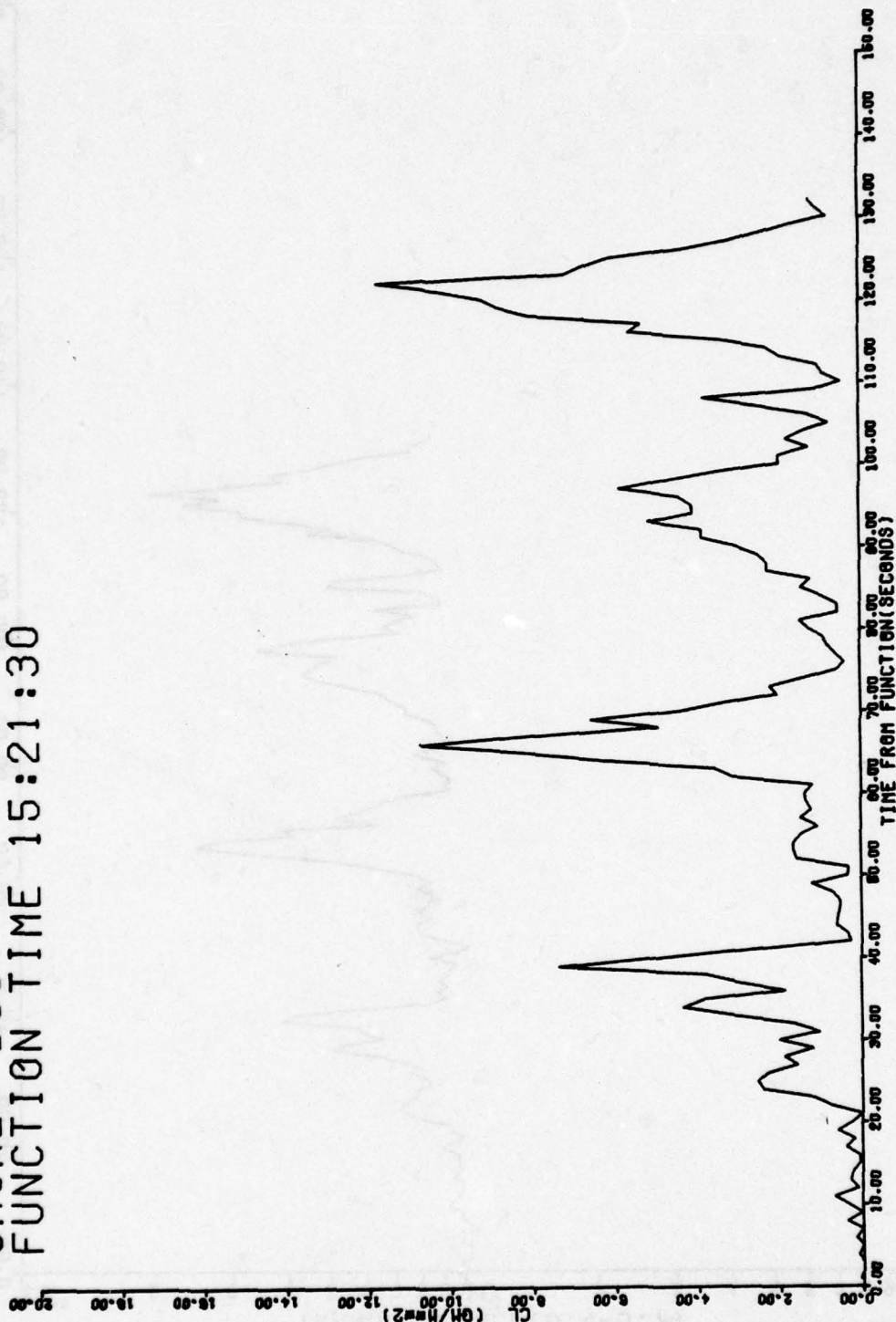
TRANSMITTANCE(0.4-0.7)  
10<sup>1</sup>  
10<sup>0</sup>  
9  
8  
7  
6  
5  
4  
3  
2  
1  
0

B-3-9

0.00 20.00 40.00 60.00 80.00 100.00 120.00 140.00 160.00 180.00 200.00  
TIME AFTER FUNCTION (SECS)

TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #P2 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:21:30



CL VALUES VERSUS TIME  
CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 4

CONTENTS

TRIAL DPI-005-P3 (DUST) 14 MAY 1978

<u>PAGE</u>	
B-4-2	TABLE OF TEST DAY DATA
B-4-3	FIGURE: DOSAGE BY SAMPLING POSITION
B-4-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-4-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-4-6	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-4-7	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-4-8	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-4-9	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-4-10	FIGURE: CL VALUES VERSUS TIME

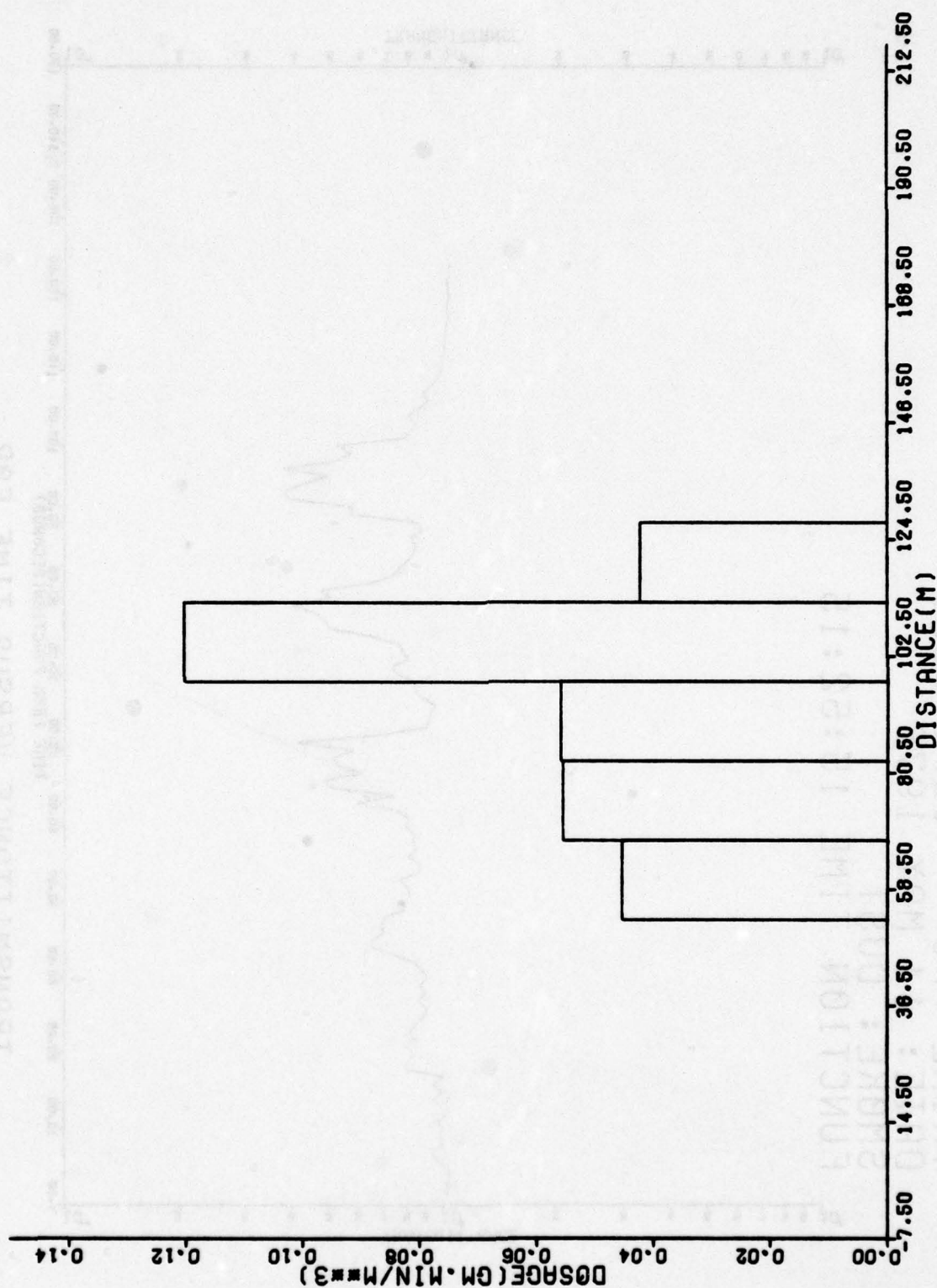
# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-P3

DATE: 14 May 1978

TIME: 1552

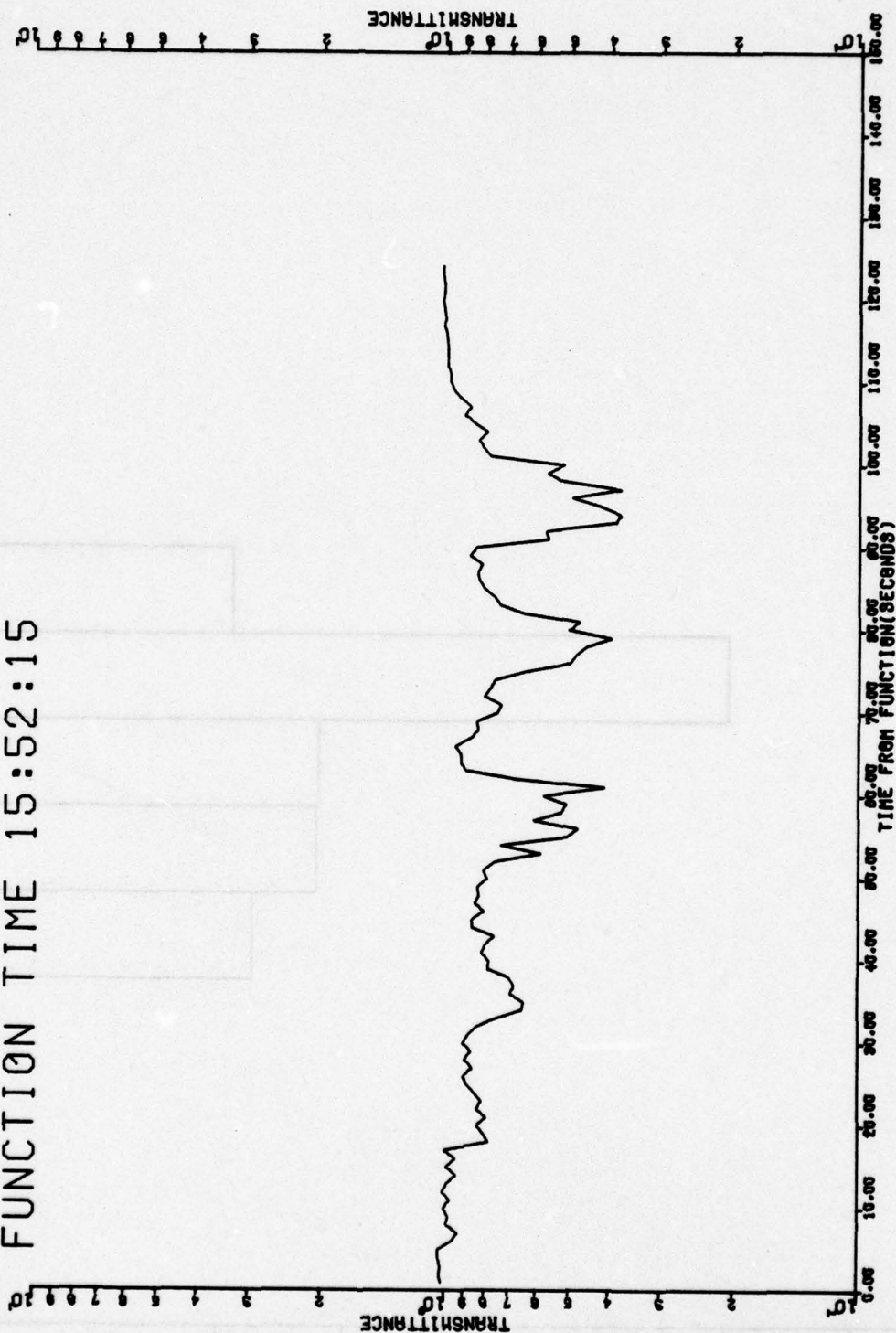
Wind Direction, degrees (2 meter) . . . . .	221
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	3.6
Relative Humidity, percent (2 meter) . . . . .	26
Temperature . . . . .	93°
Sky Conditions . . . . .	clear
Type of Munition . . . . .	NA
Number of Munitions . . . . .	NA
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.18
1.3 - 2.3 . . . . .	0.20
2.3 - 10.0 . . . . .	0.59
10.0 - 15.0 . . . . .	0.02
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
$\text{Log}_{10}$ NMD . . . . .	0.414
$\sigma \text{Log}_{10}$ NMD . . . . .	0.293
NMD ( $\mu\text{m}$ ) . . . . .	2.59



B-4-3

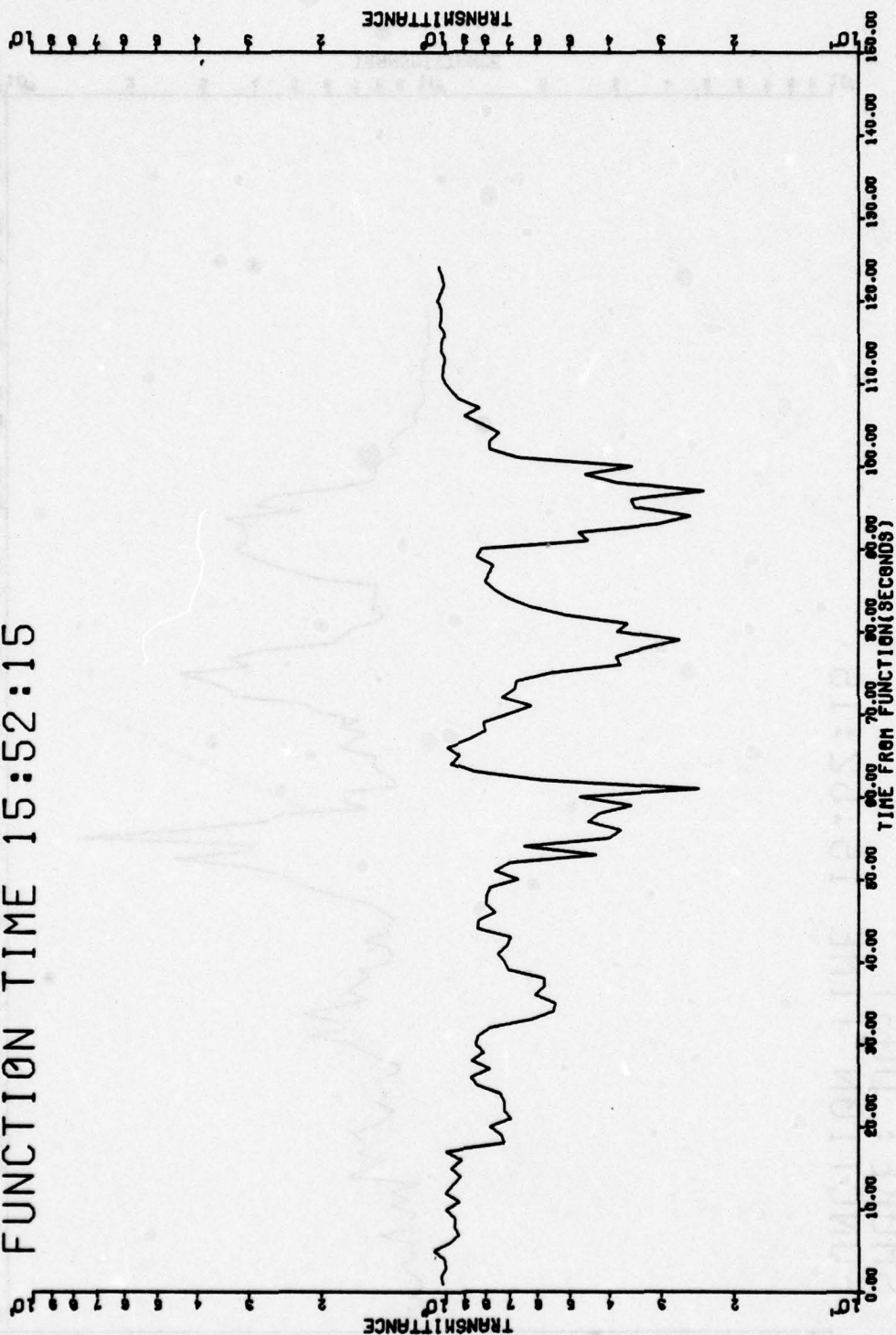
TRIAL P3, FT. SILL TESTS, 14 MAY 78, 15:52:15, DUST

TRIAL #P3 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:52:15



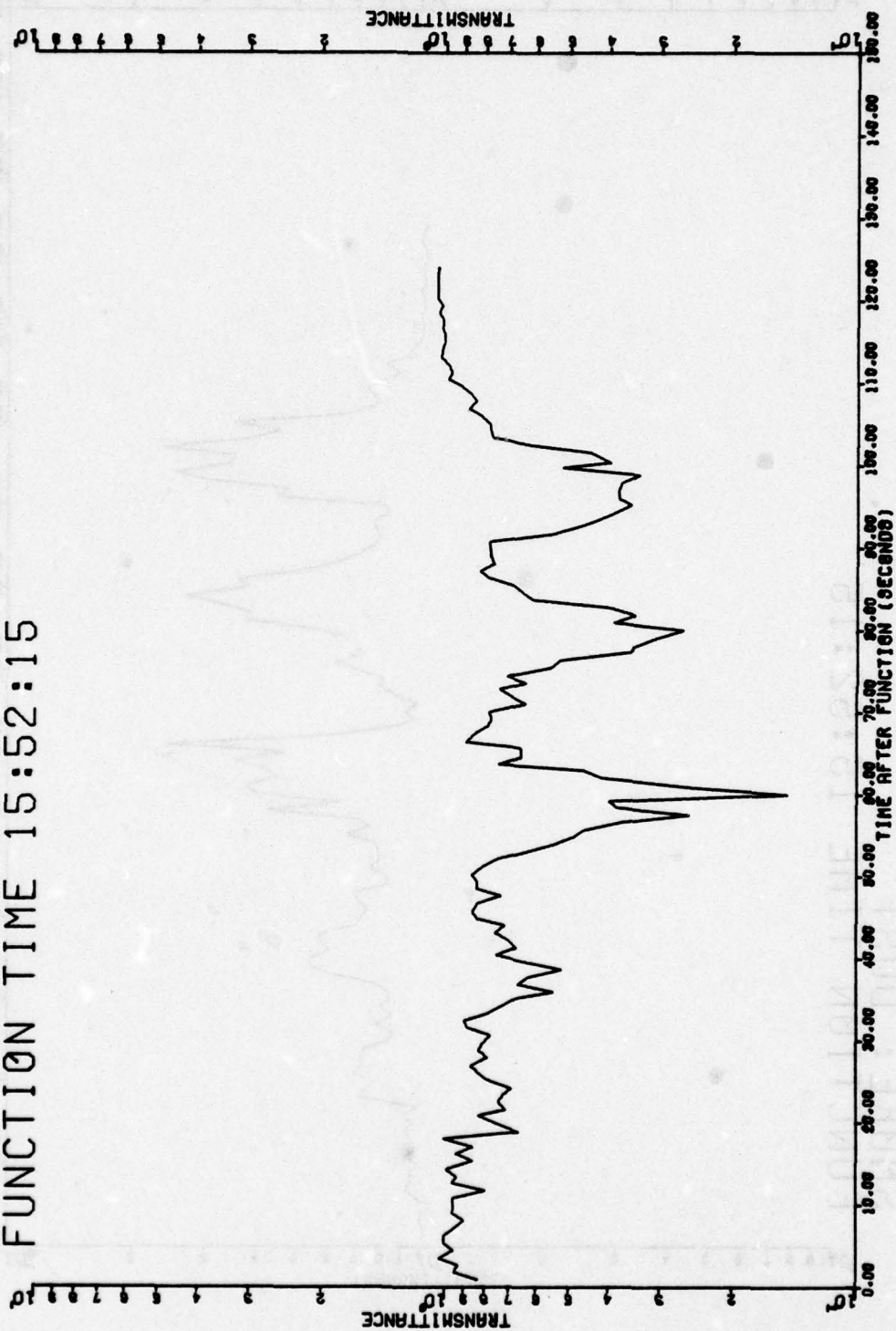
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #P3 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:52:15



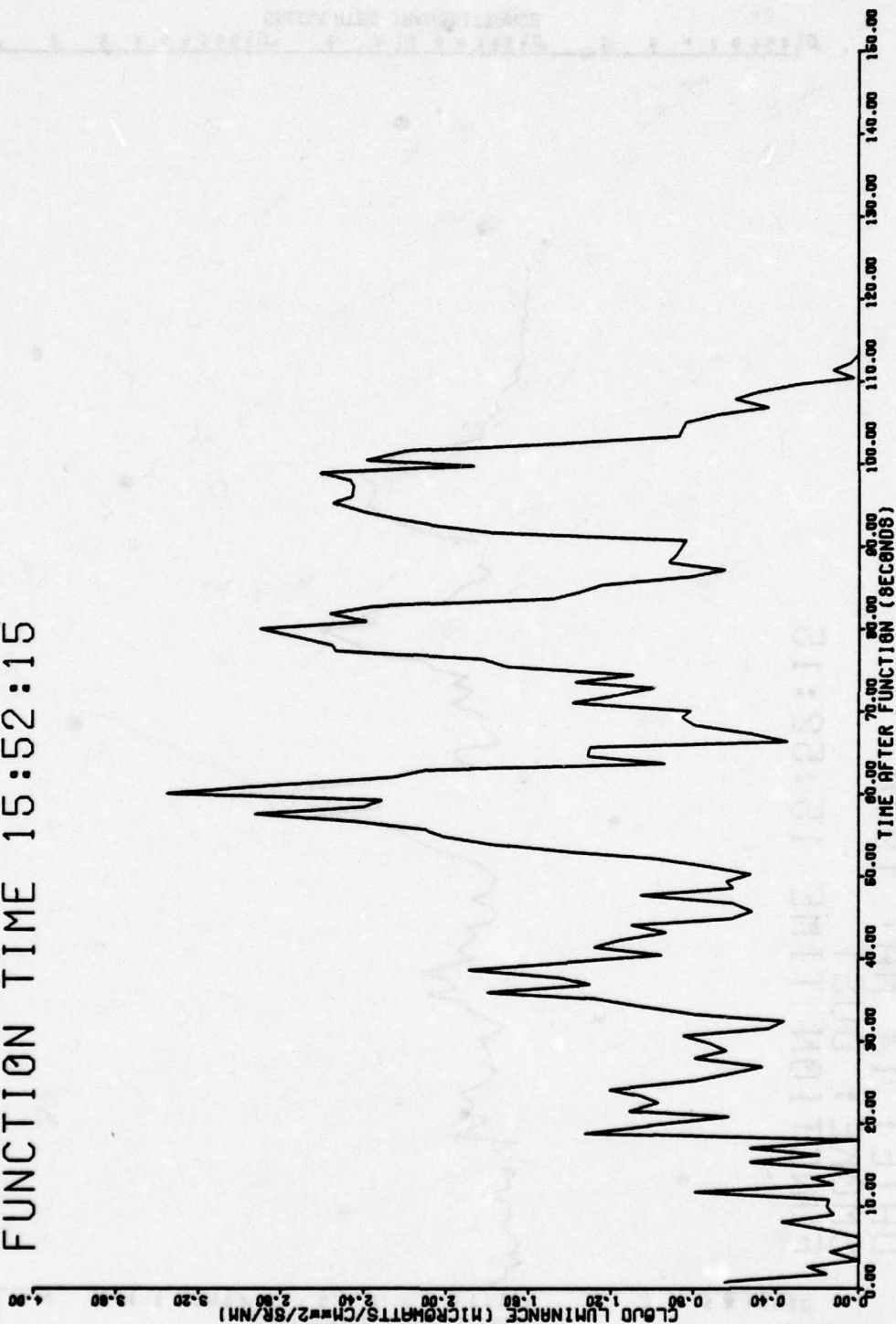
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #P3 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:52:15



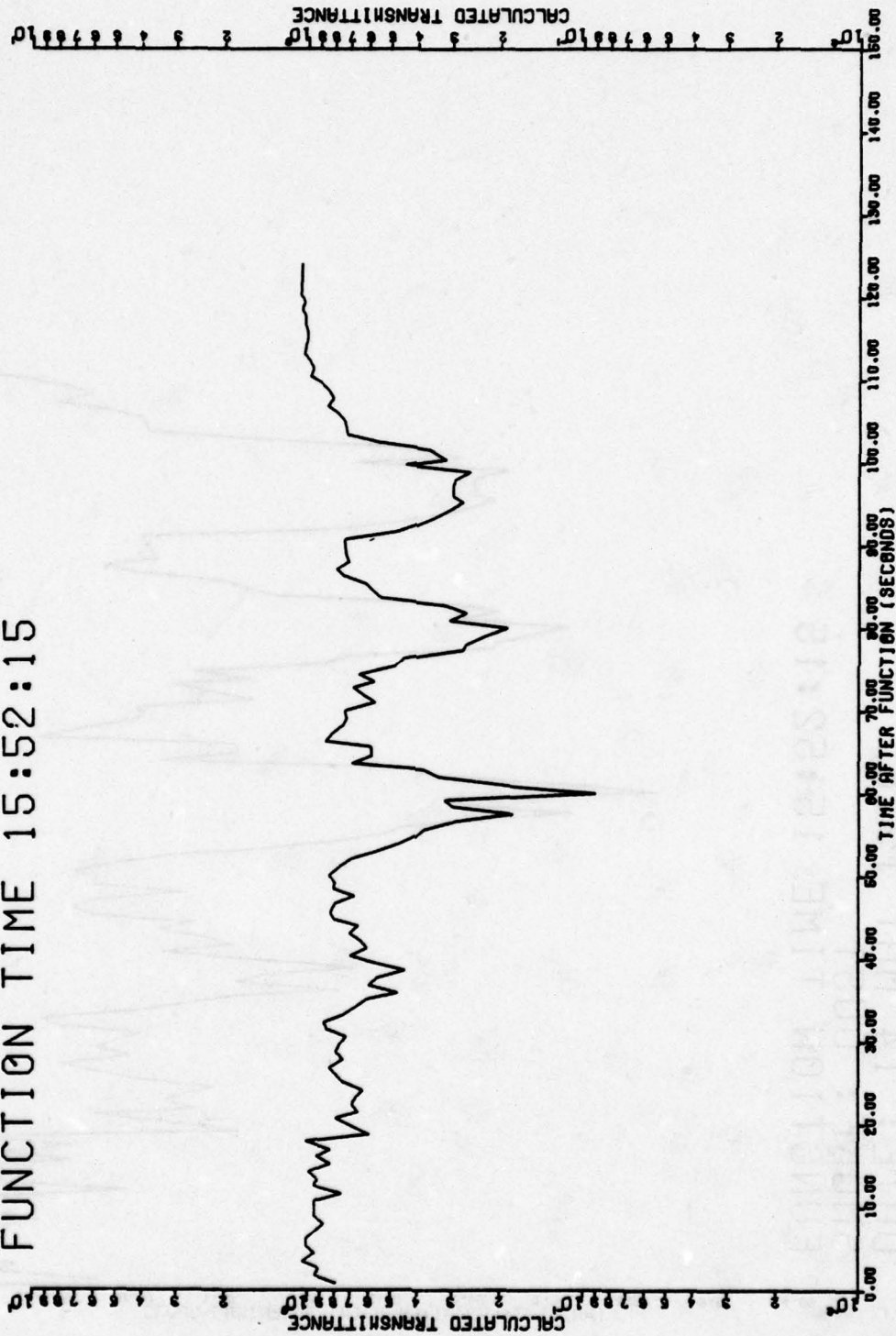
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #P3 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:52:15



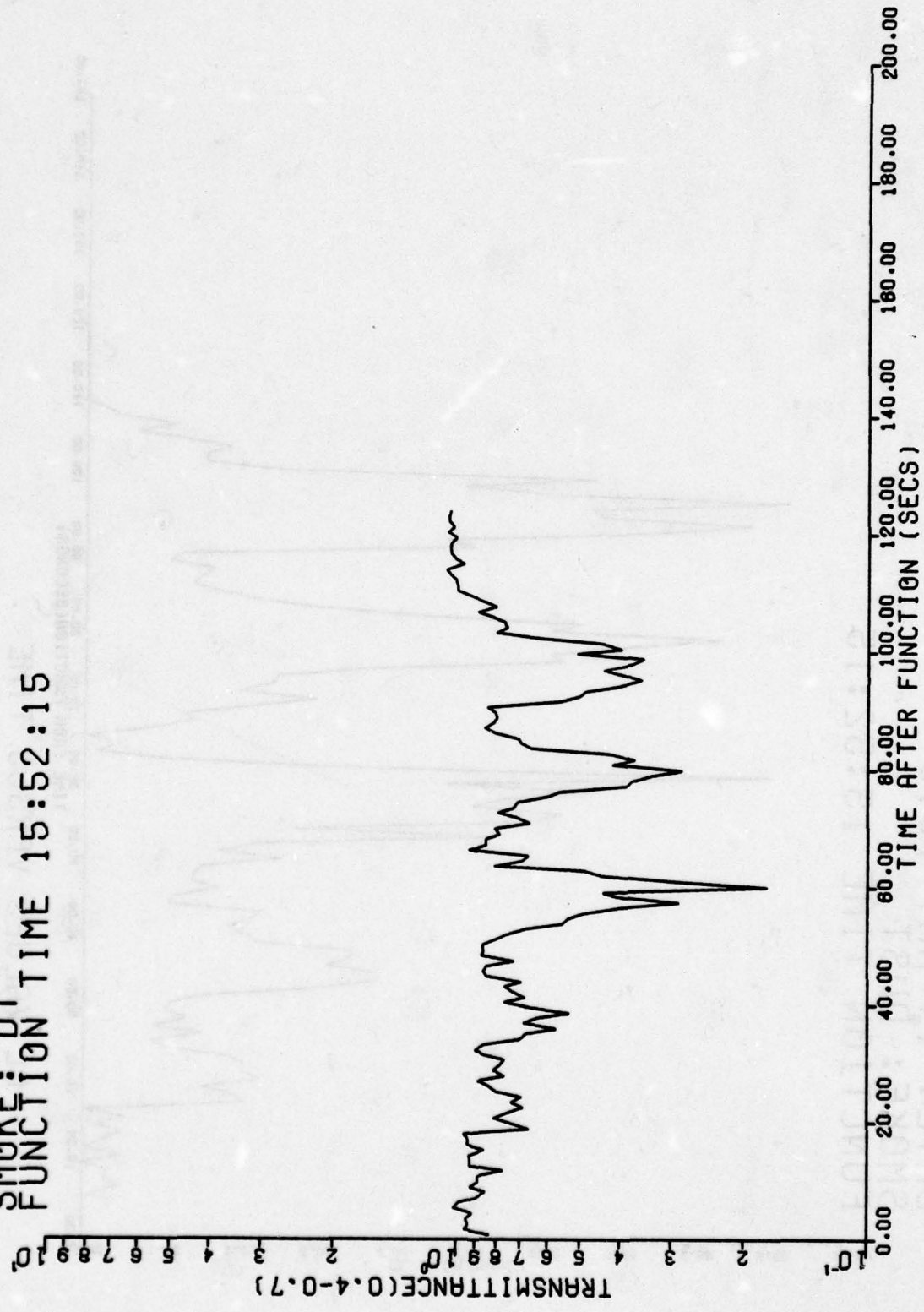
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #P3 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:52:15



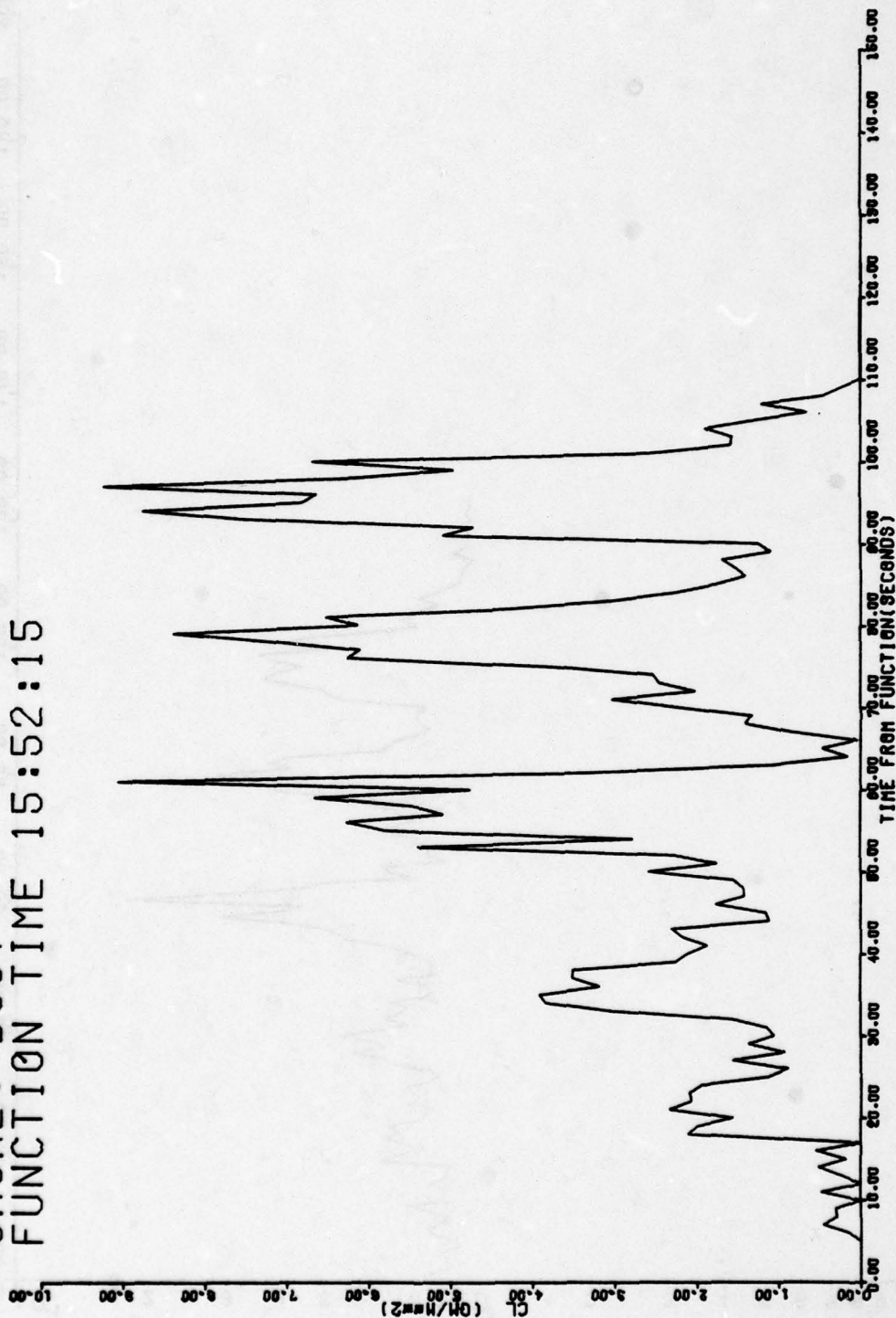
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 (μm)

TRIAL P3: FT. SILL TESTS  
 DATE: 14 MAY 1978  
 SMOKE: D1  
 FUNCTION TIME 15:52:15



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 (μm)

TRIAL #P3 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 15:52:15



CL VALUES VERSUS TIME  
CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 5

CONTENTS

TRIAL DPI-005-P4 (DUST) 14 MAY 1978

PAGE

B-5-2

TABLE OF TEST DAY DATA

B-5-3

FIGURE: DOSAGE BY SAMPLING POSITION

B-5-4

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
9.750  $\mu\text{m}$

B-5-5

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
3.443  $\mu\text{m}$

B-5-6

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-5-7

FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-5-8

FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7  $\mu\text{m}$

B-5-9

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
BETWEEN 0.4 AND 0.7  $\mu\text{m}$

B-5-10

FIGURE: CL VALUES VERSUS TIME

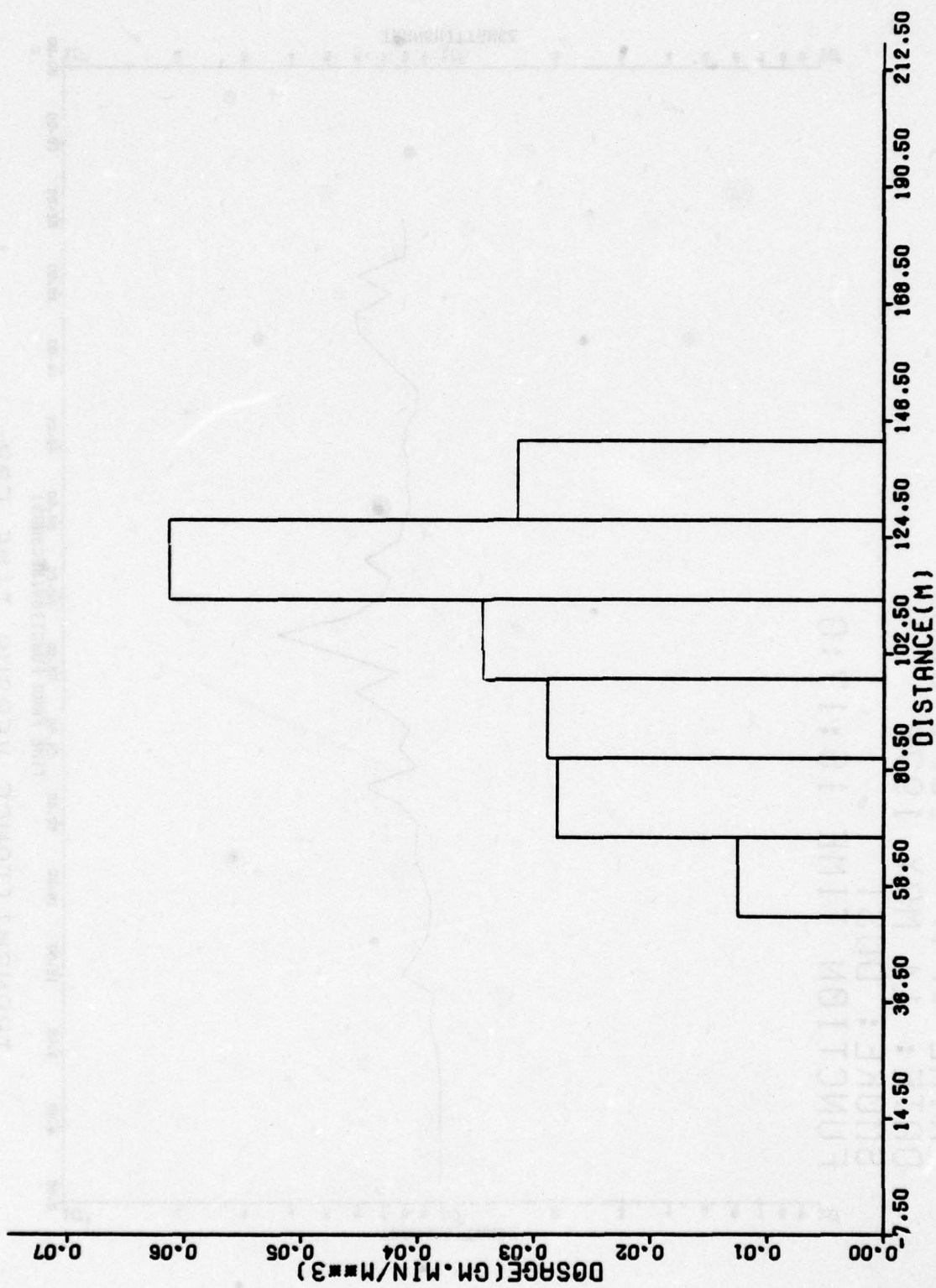
# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-P4

DATE: 14 May 1978

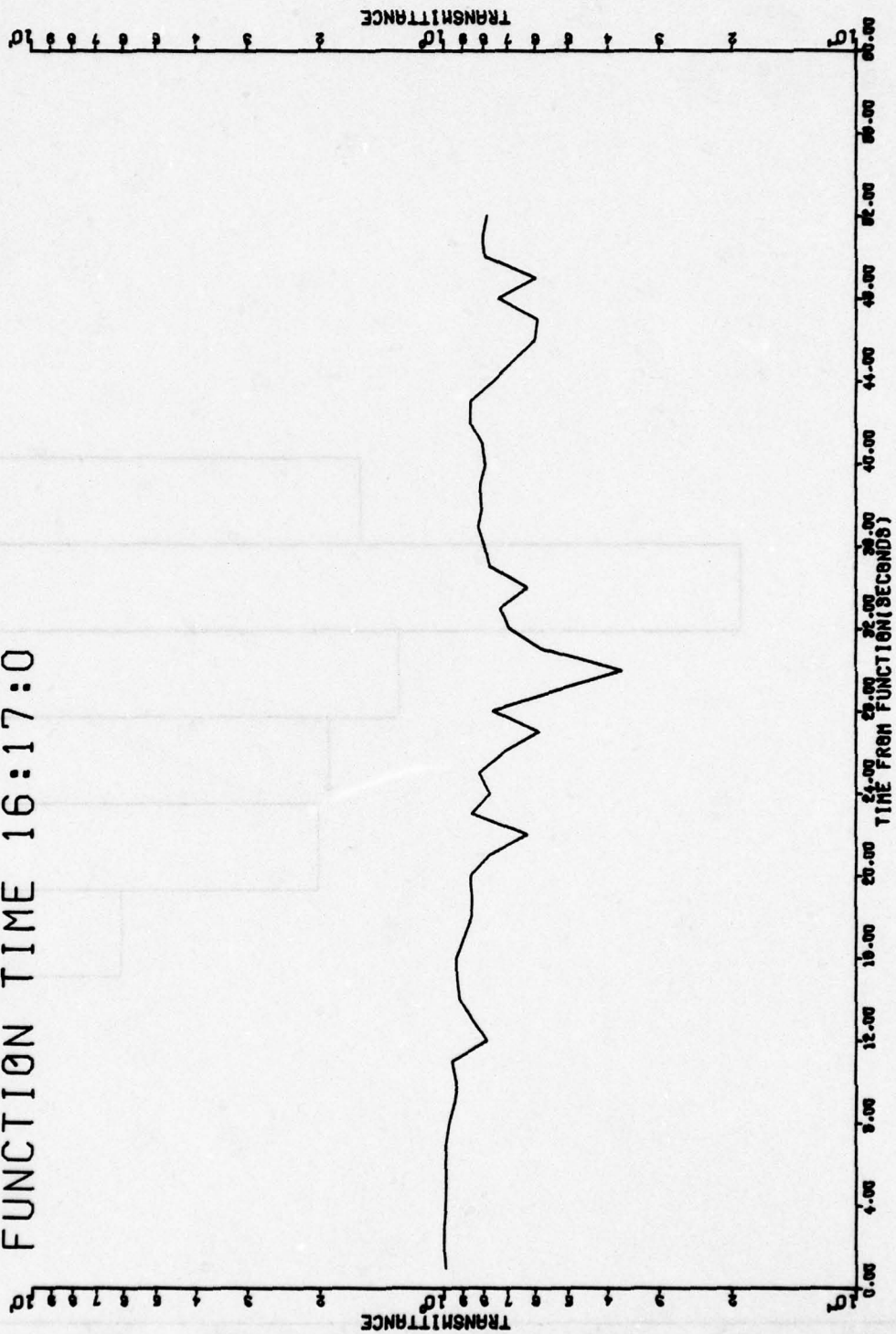
TIME: 1617

Wind Direction, degrees (2 meter) . . . . .	211
Wind Speed, $\bar{u}$ , meters/second (2 meter). . . . .	5.1
Relative Humidity, percent (2 meter) . . . . .	26
Temperature . . . . .	93°
Sky Conditions . . . . .	clear
Type of Munition . . . . .	NA
Number of Munitions . . . . .	NA
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.13
1.3 - 2.3 . . . . .	0.15
2.3 - 10.0 . . . . .	0.71
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
$\text{Log}_{10}$ NMD . . . . .	0.449
$\sigma_{\text{Log}_{10}}$ NMD . . . . .	0.248
NMD ( $\mu\text{m}$ ) . . . . .	2.81



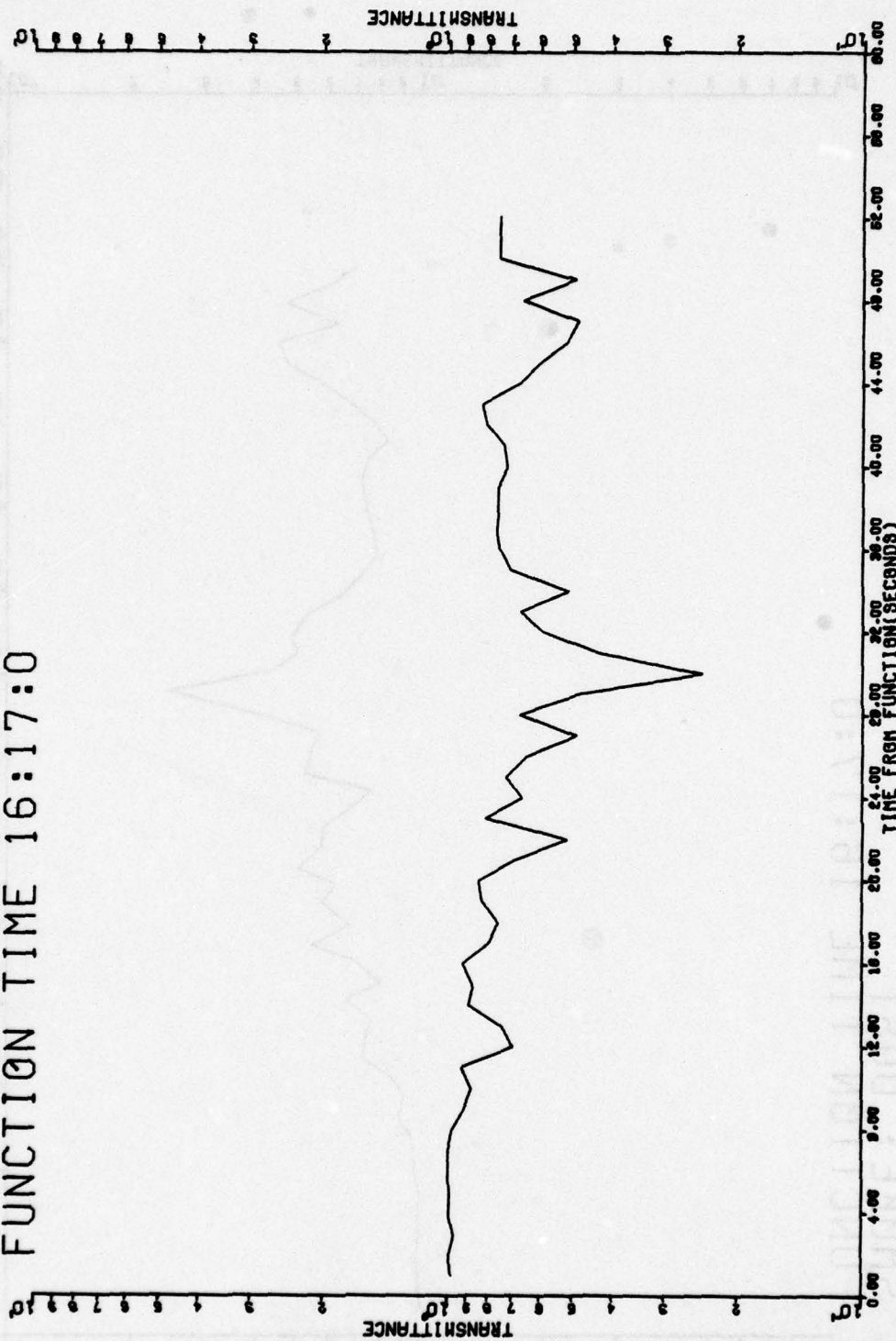
TRIAL P4, FT. SILL TESTS, 14 MAY 78, 16:17:00, DUST

TRIAL #P4 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 16:17:0



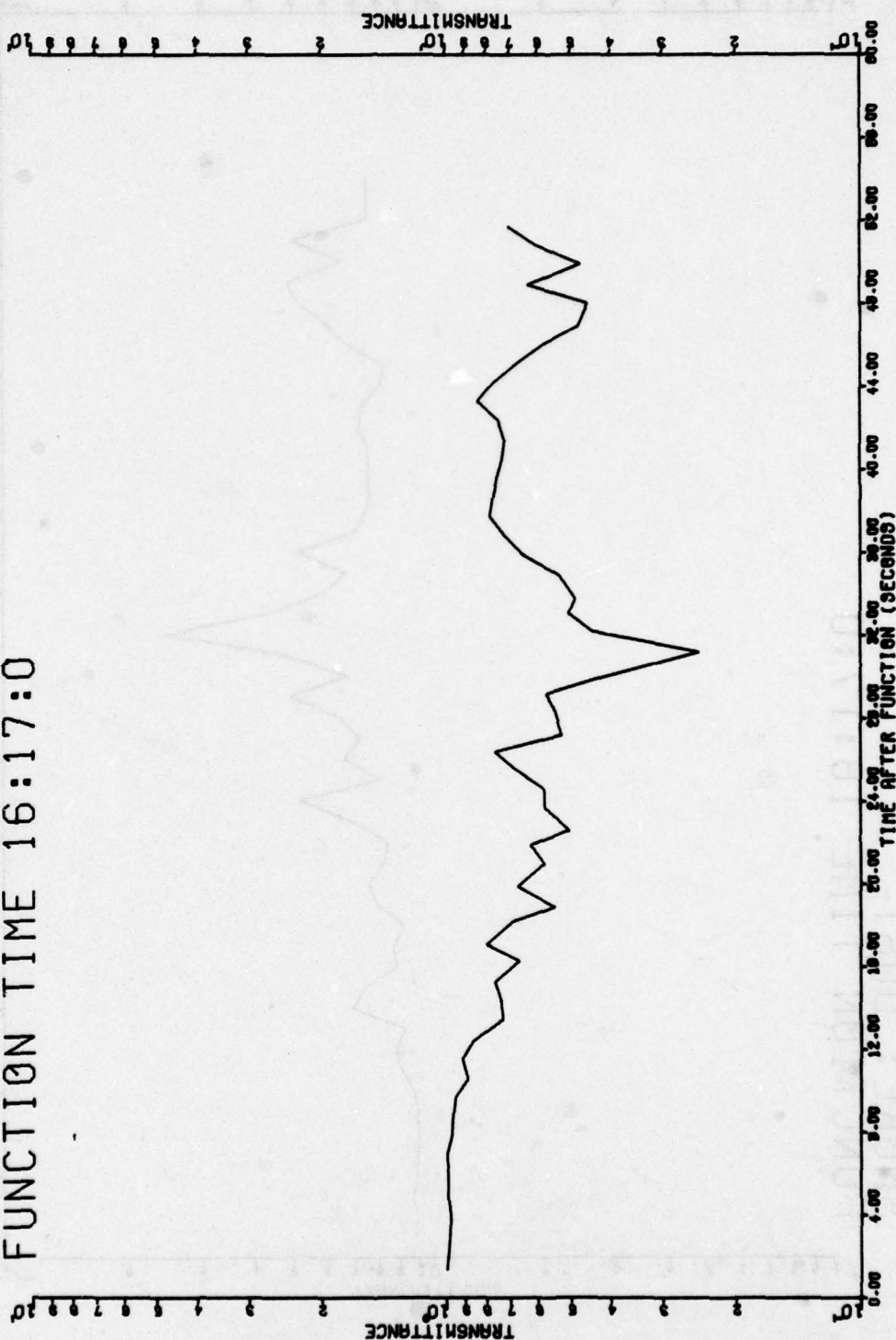
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #P4 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 16:17:0



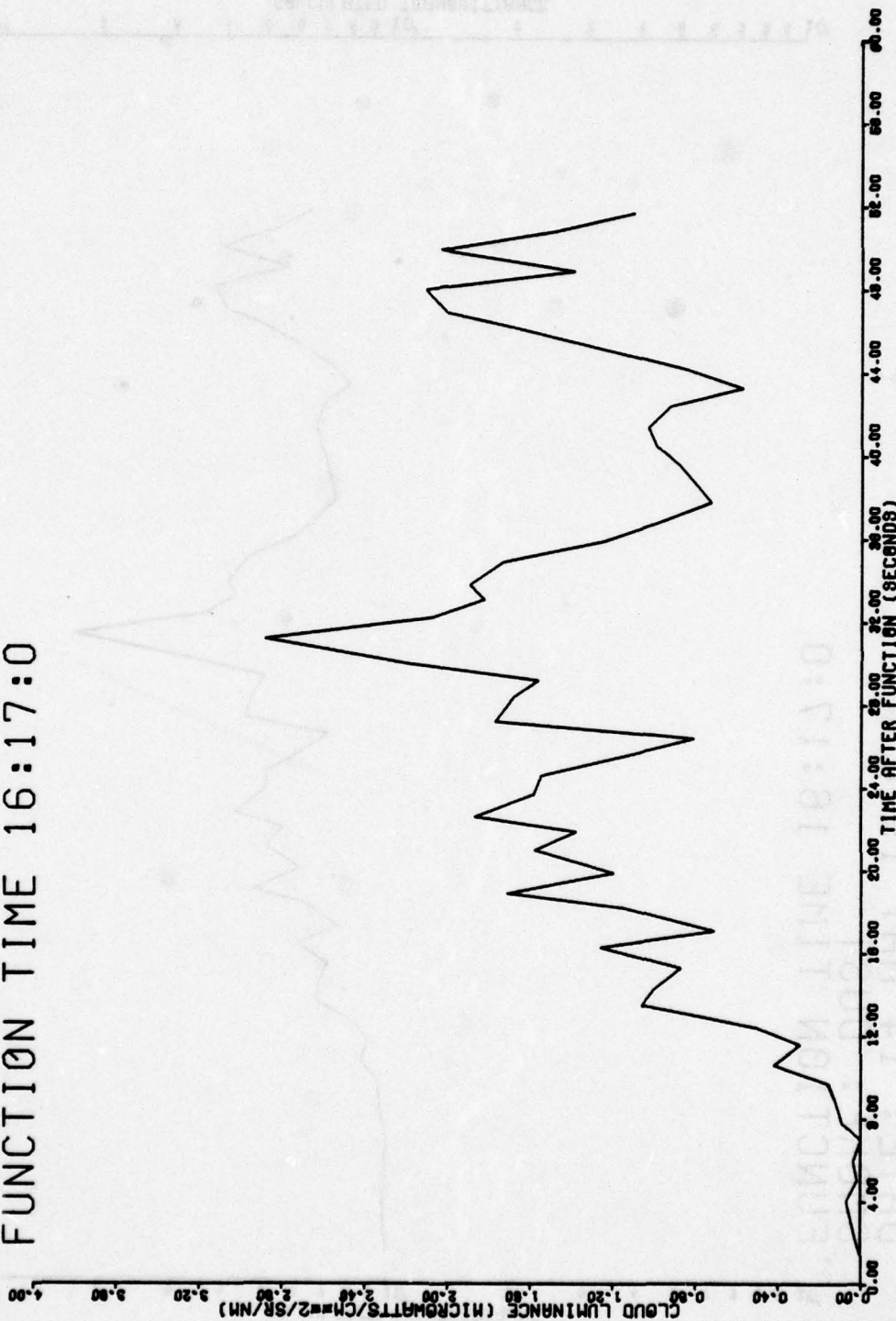
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #P4 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 16:17:0



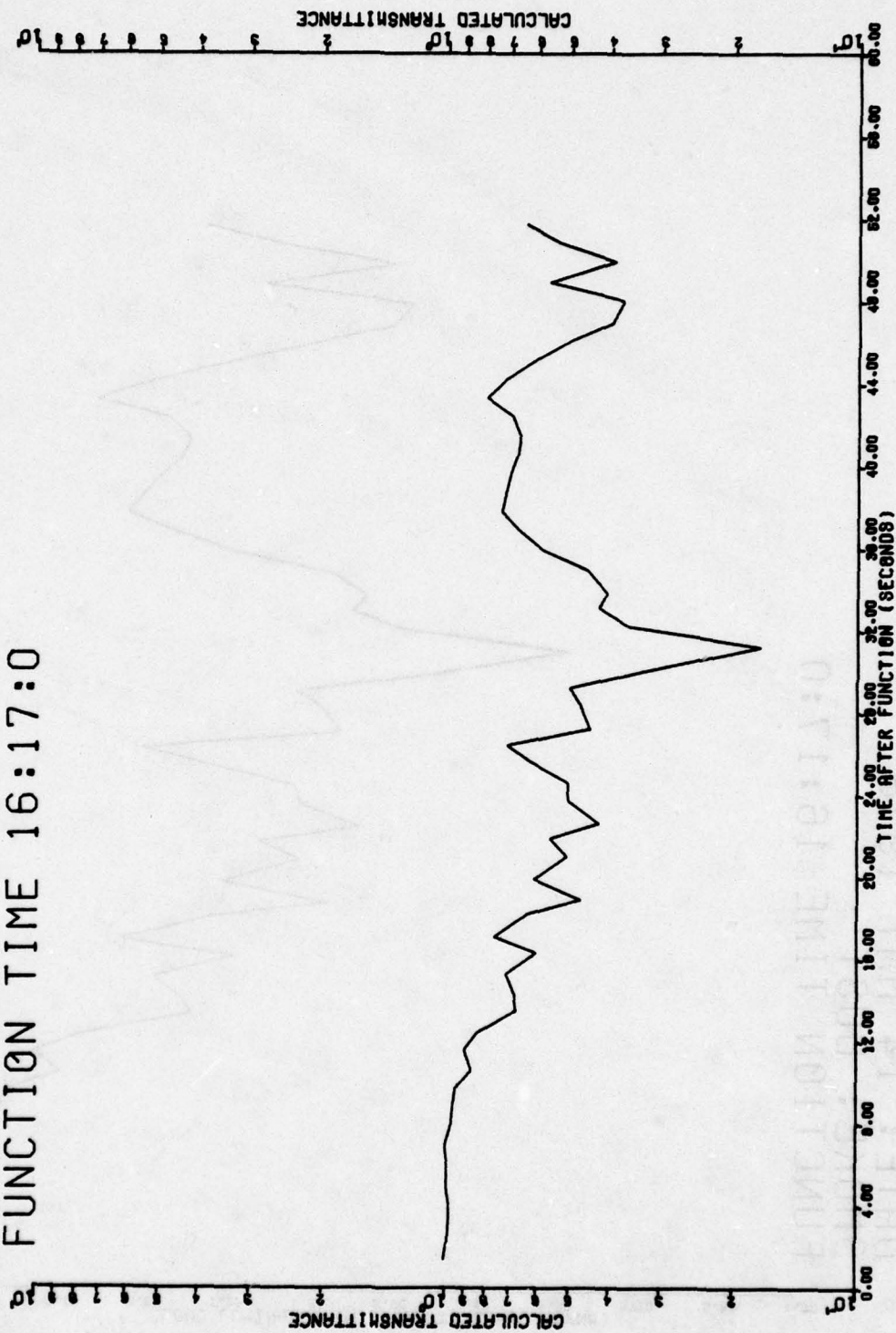
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #P4 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 16:17:0

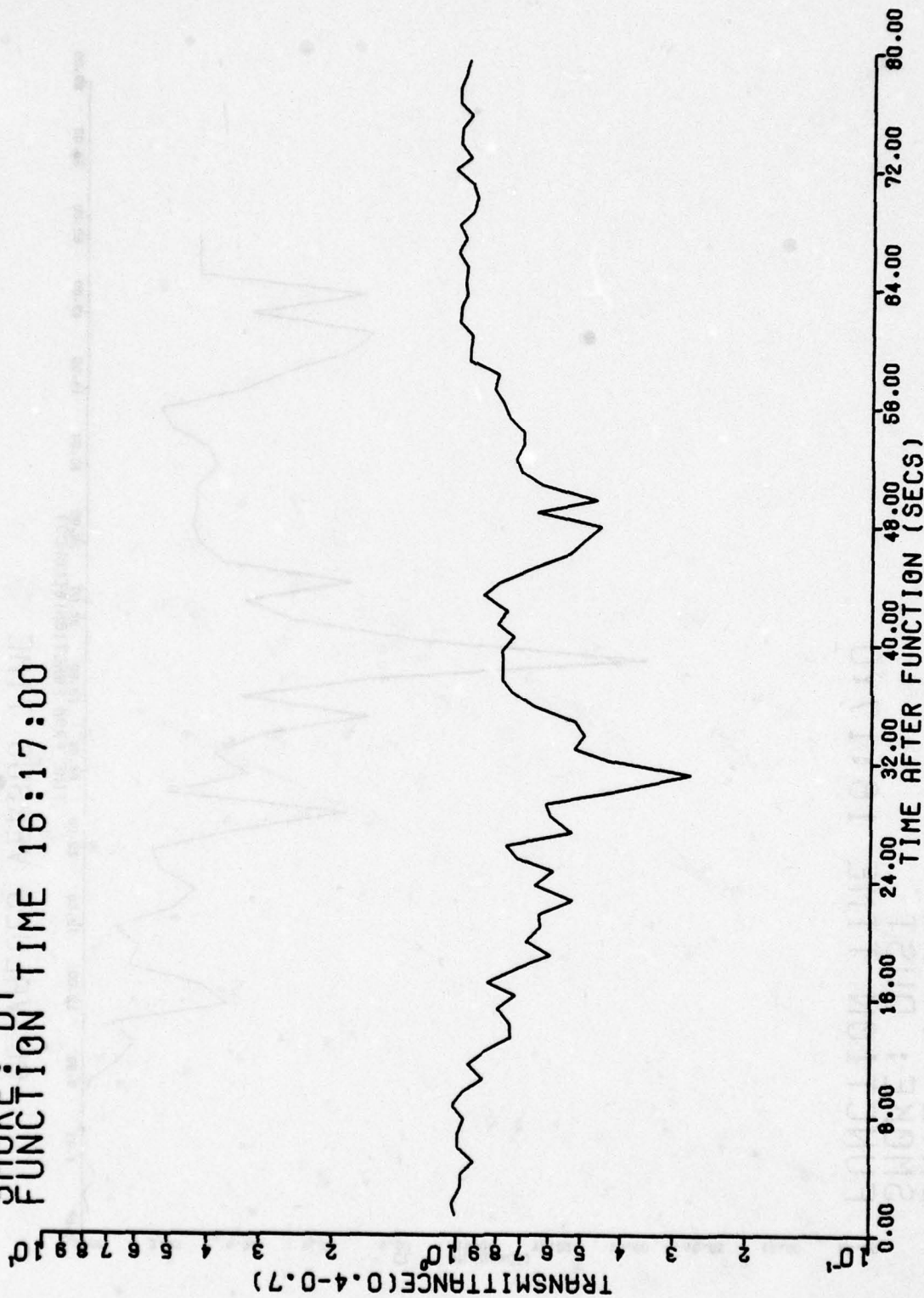


CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #P4 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 16:17:0

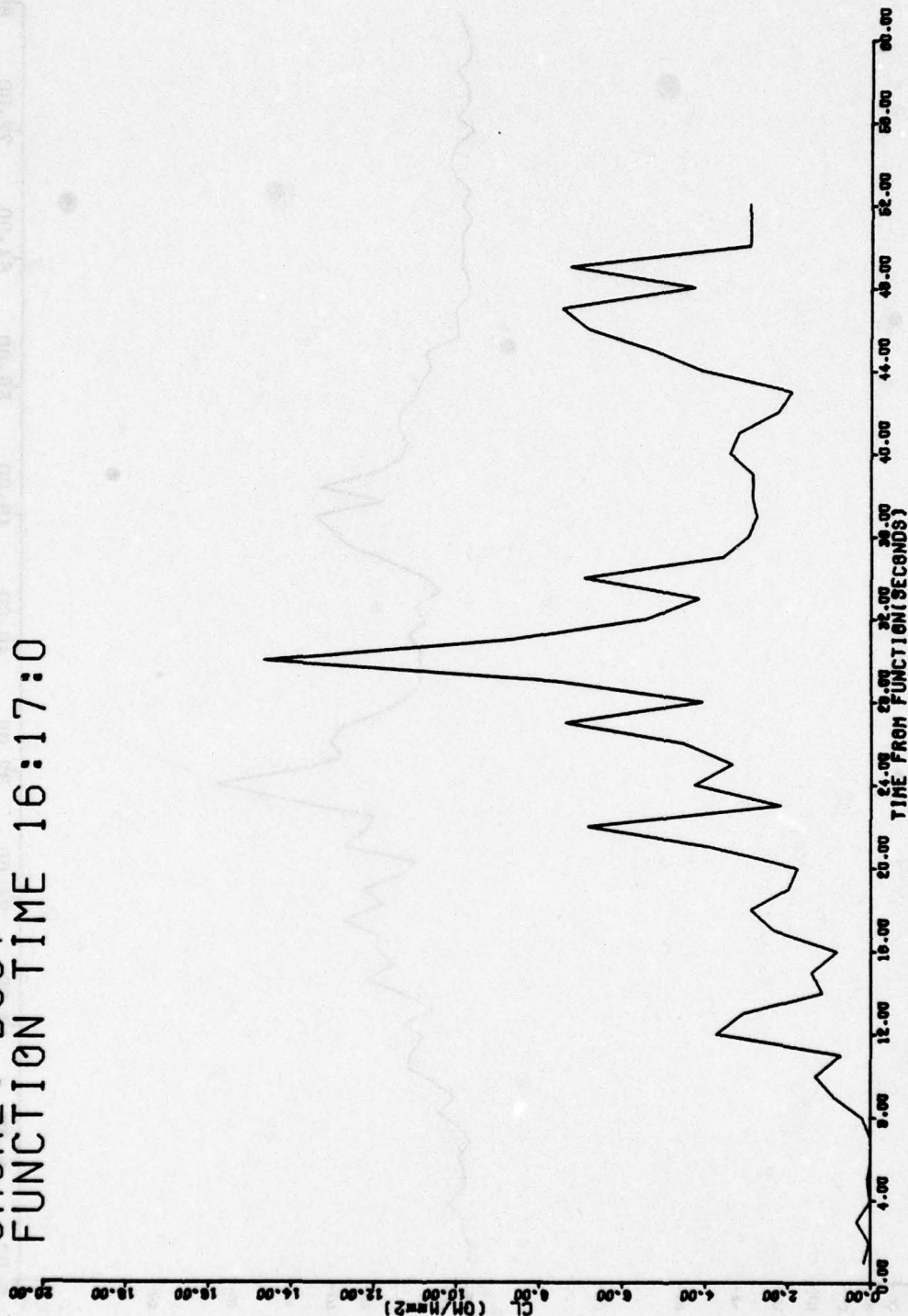


TRIAL P4; FT. SILL TESTS  
DATE: 14 MAY 1978  
SMOKE: DT  
FUNCTION TIME 16:17:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #P4 [DP1-005]  
DATE: 14 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 16:17:0



CL VALUES VERSUS TIME  
CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 6

CONTENTS

TRIAL DPI-005-T3 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-6-2	TABLE OF TEST DAY DATA
B-6-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-6-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-6-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-6-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-6-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-6-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-6-9	FIGURE: CL VALUES VERSUS TIME
B-6-10	FIGURE: MUNITION DETONATION FOR TRIAL 3
B-6-11	FIGURE: DUST/DEBRIS CLOUD 10 SECONDS AFTER DETONATION

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T3

DATE: 16 May 1978

TIME: 0954

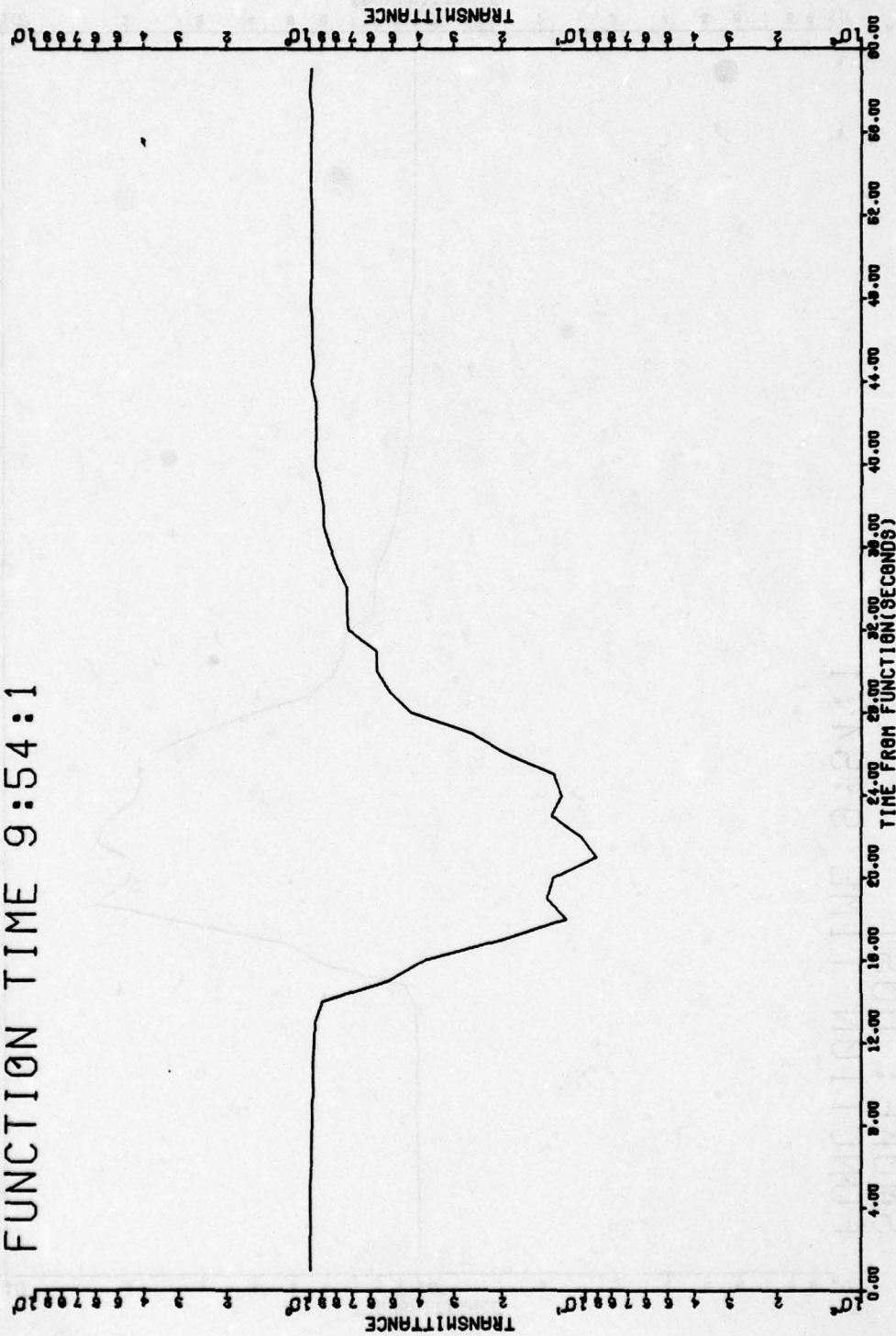
Wind Direction, degrees (2 meter) . . . . .	111
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	7.3
Relative Humidity, percent (2 meter) . . . . .	63
Temperature . . . . .	68°
Sky Conditions . . . . .	scattered
Type of Munition . . . . .	M107, 155 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	090
Range (meter) . . . . .	157
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.40
1.3 - 2.3 . . . . .	0.32
2.3 - 10.0 . . . . .	0.27
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
$\text{Log}_{10}$ NMD . . . . .	0.187
$\sigma \text{Log}_{10}$ NMD . . . . .	0.274
NMD ( $\mu\text{m}$ ) . . . . .	1.54

TRIAL #3 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:54:1



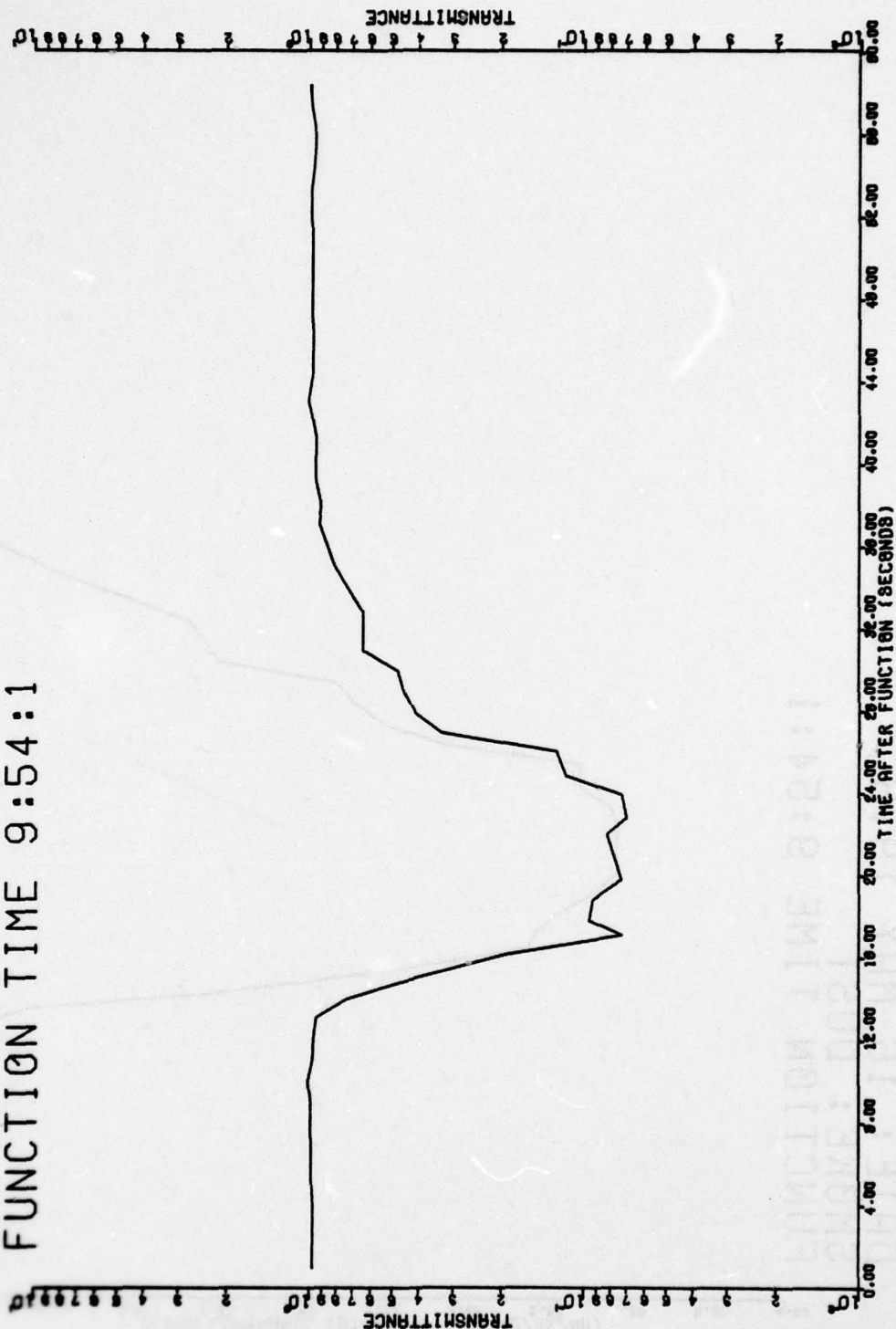
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #3 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:54:1



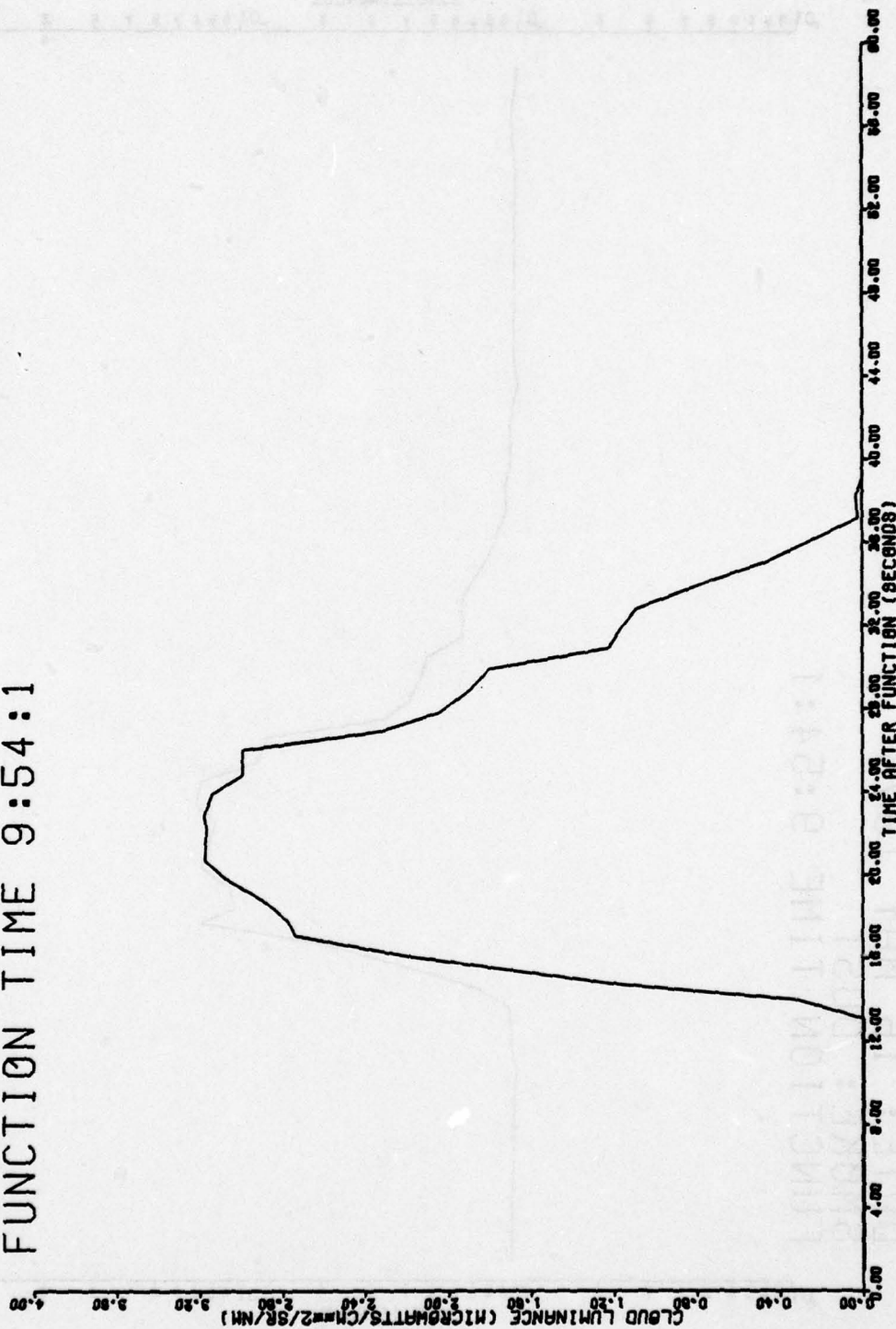
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #3 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:54:1



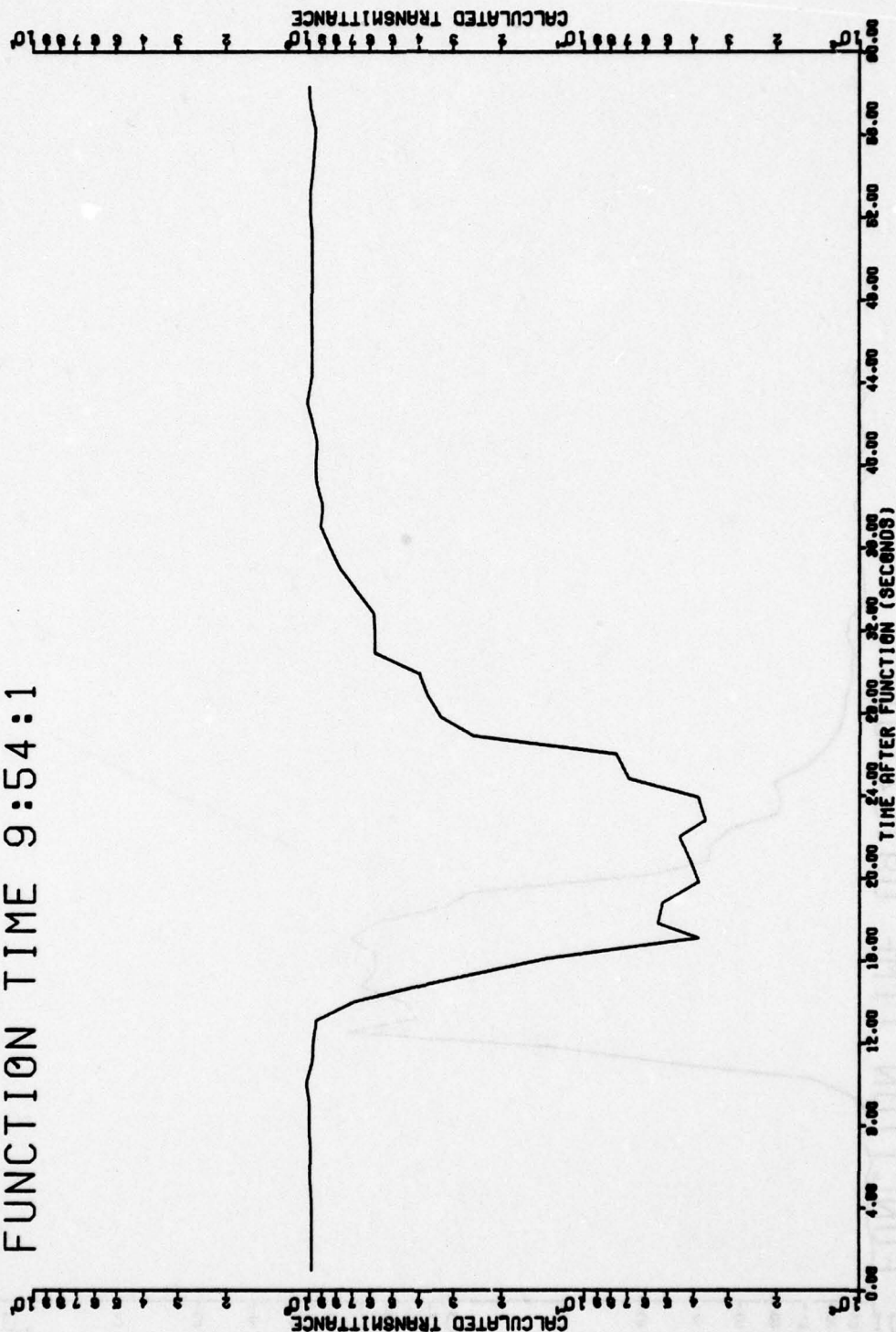
TRANSMITTANCE VERSUS TIME FOR  
 WAVELENGTH 1.060 (μm)

TRIAL #3 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:54:1



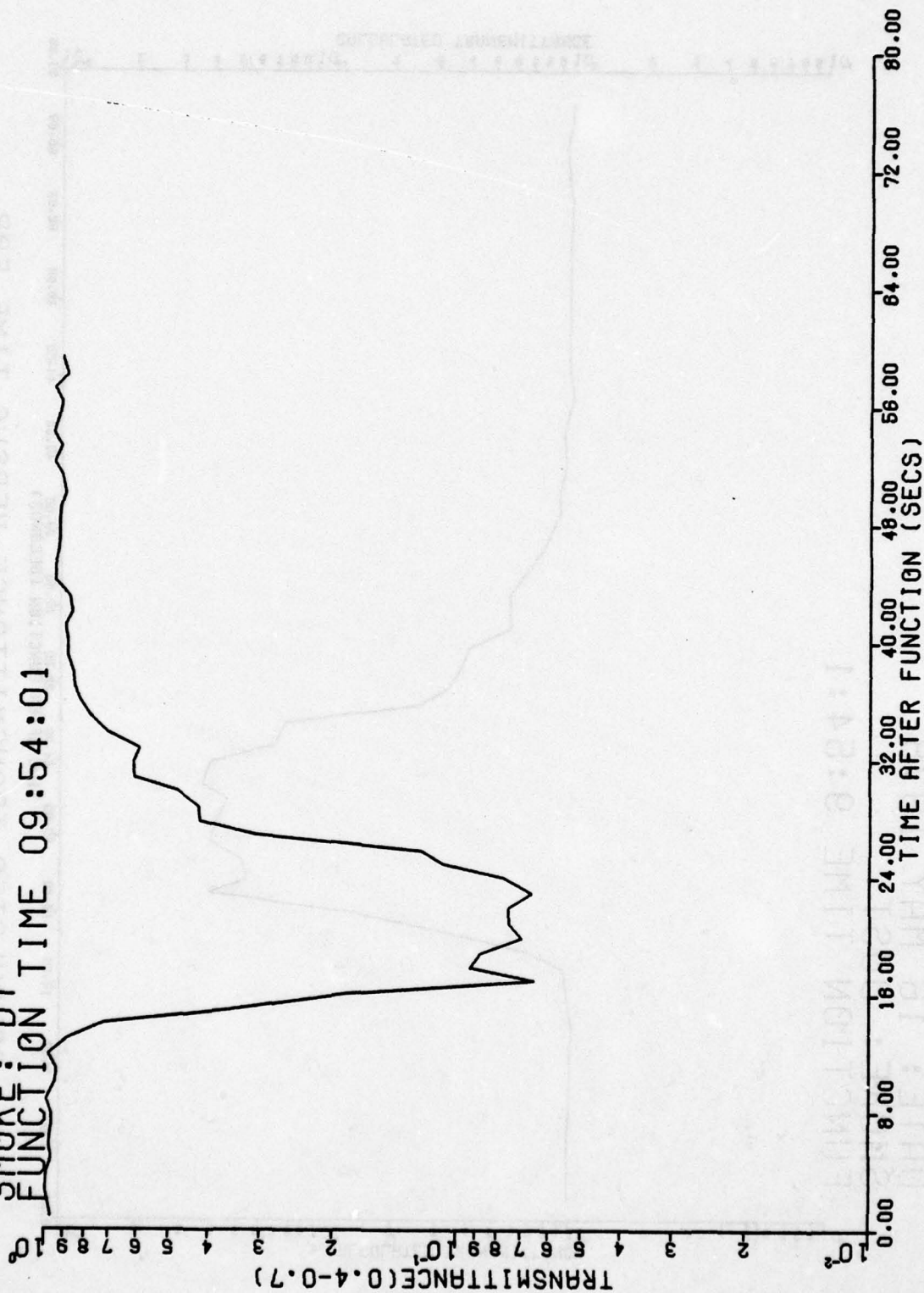
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #3 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:54:1



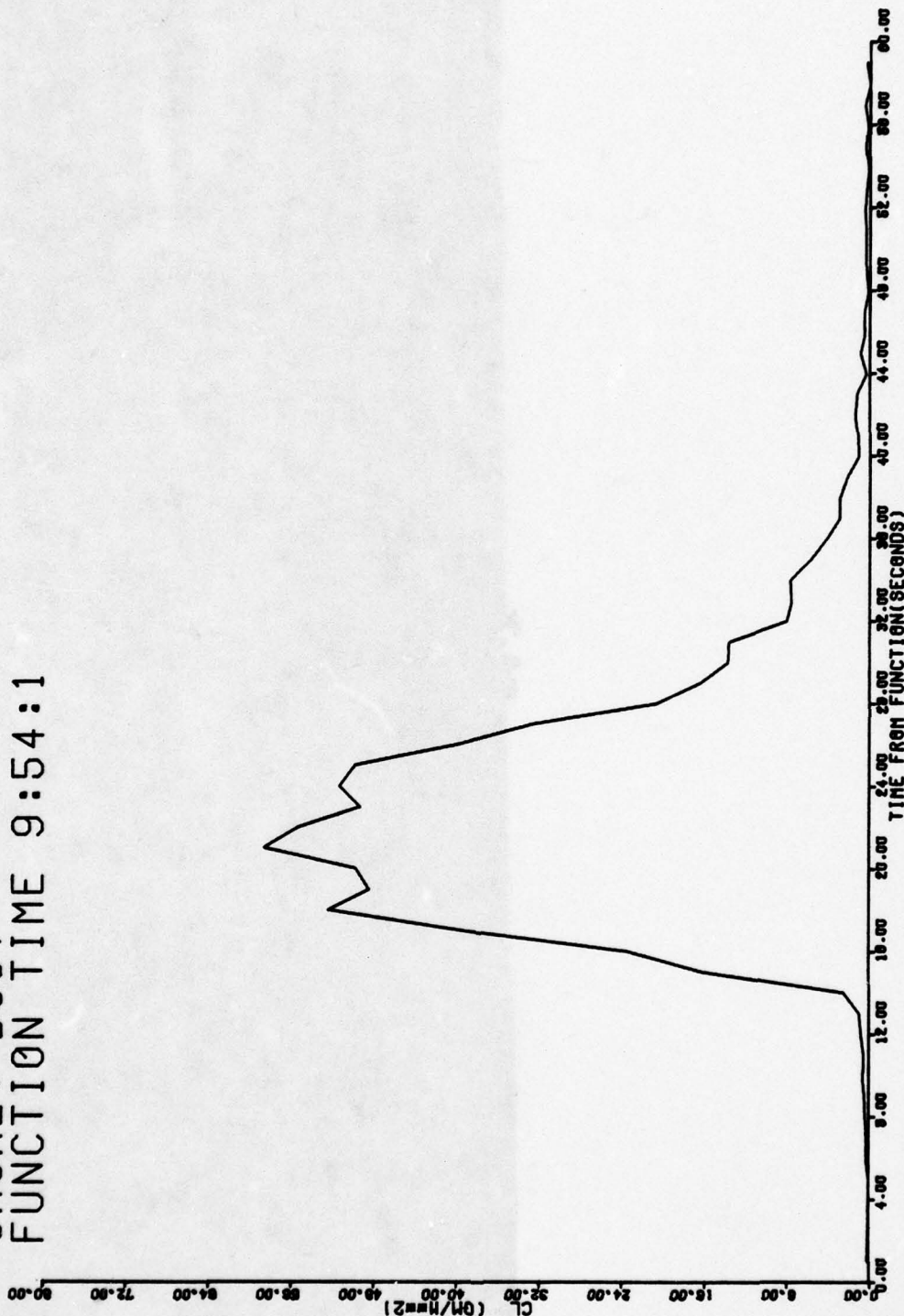
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 3, FT. SILL TESTS  
DATE: 16 MAY 1978  
SMOKE: DT  
FUNCTION TIME 09:54:01



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu$ m)

TRIAL #3 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:54:1



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

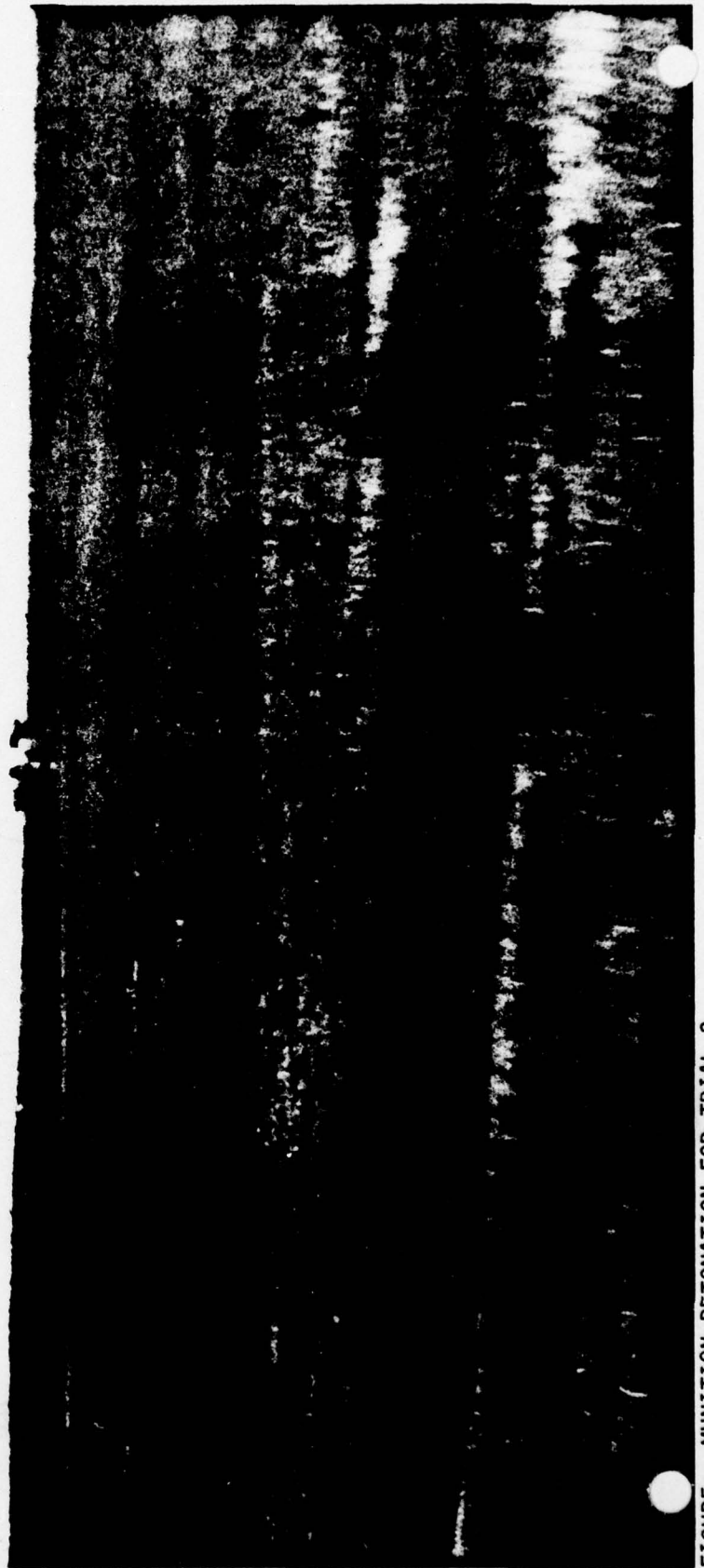


FIGURE: MUNITION DETONATION FOR TRIAL 3

B-6-10



FIGURE: DUST/DEBRIS CLOUD 10 SECONDS AFTER DETONATION

B-6-11

APPENDIX B, SECTION 7

CONTENTS

TRIAL DPI-005-T4 (DUST) 16 MAY 1978

PAGE

B-7-2

TABLE OF TEST DAY DATA

B-7-3

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
9.750  $\mu\text{m}$

B-7-4

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
3.443  $\mu\text{m}$

B-7-5

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-7-6

FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-7-7

FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7  $\mu\text{m}$

B-7-8

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
BETWEEN 0.4 AND 0.7  $\mu\text{m}$

B-7-9

FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T4

DATE: 16 May 1978

TIME: 1134

Wind Direction, degrees (2 meter) . . . . .	122
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.8
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	71°
Sky Conditions . . . . .	scattered
Type of Munition . . . . .	M107, 155 mm
Number of Munitions . . . . .	3
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	035*
Range (meter) . . . . .	132

Particle size data are not available since the cloud did not encompass the PSA.

\*Average Azimuth and Range

TRIAL #4 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:31:0



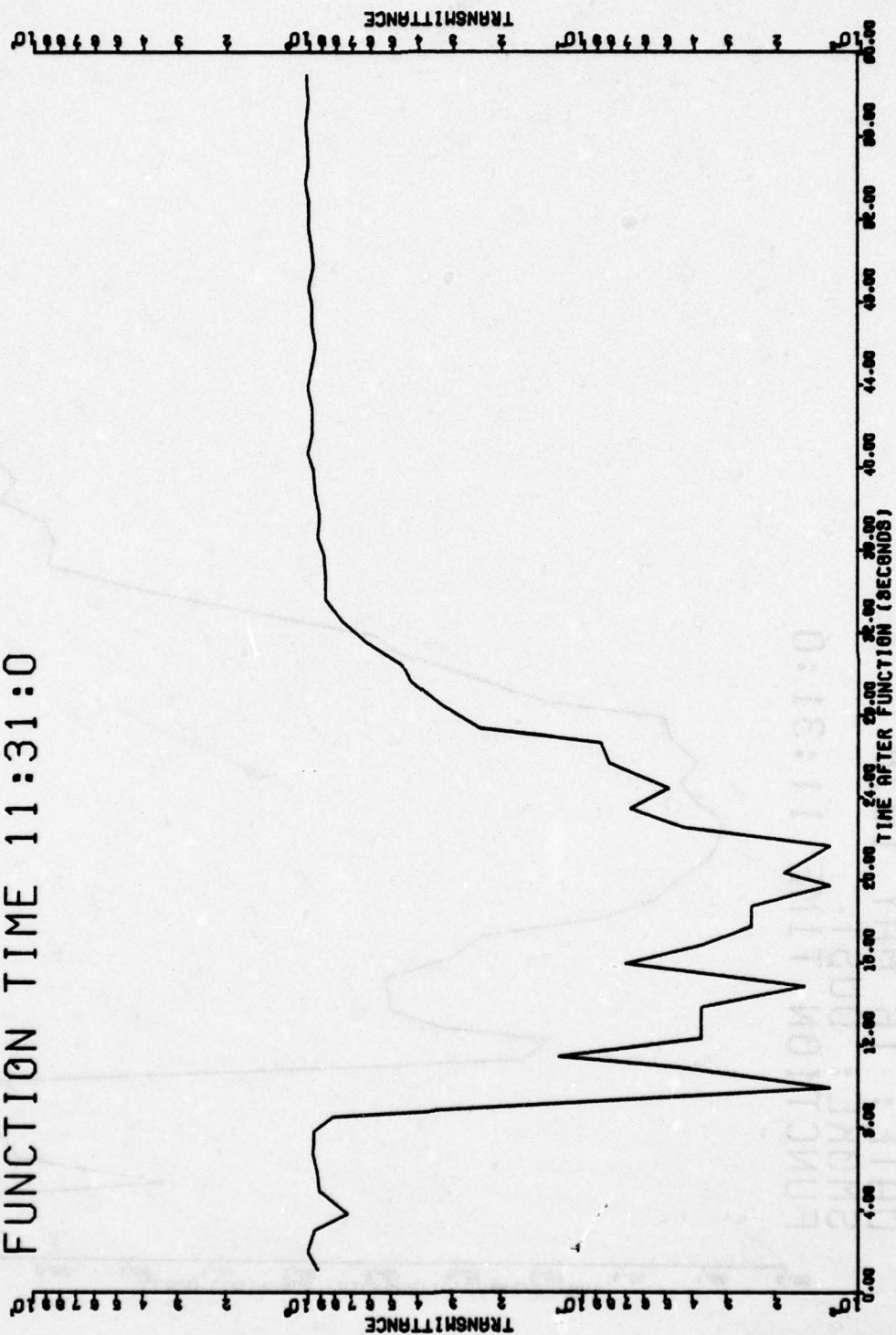
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #4 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:31:0



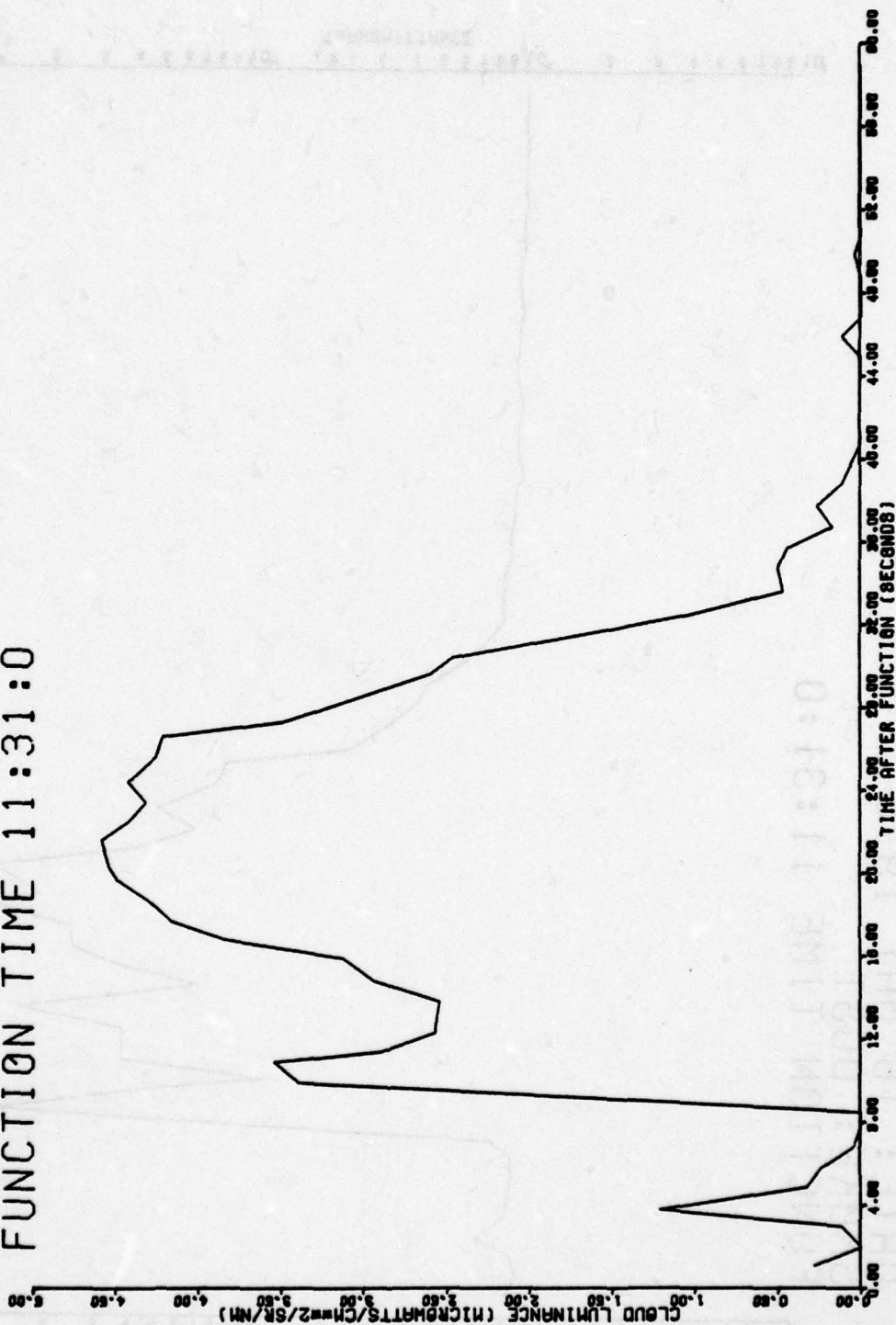
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #4 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:31:0



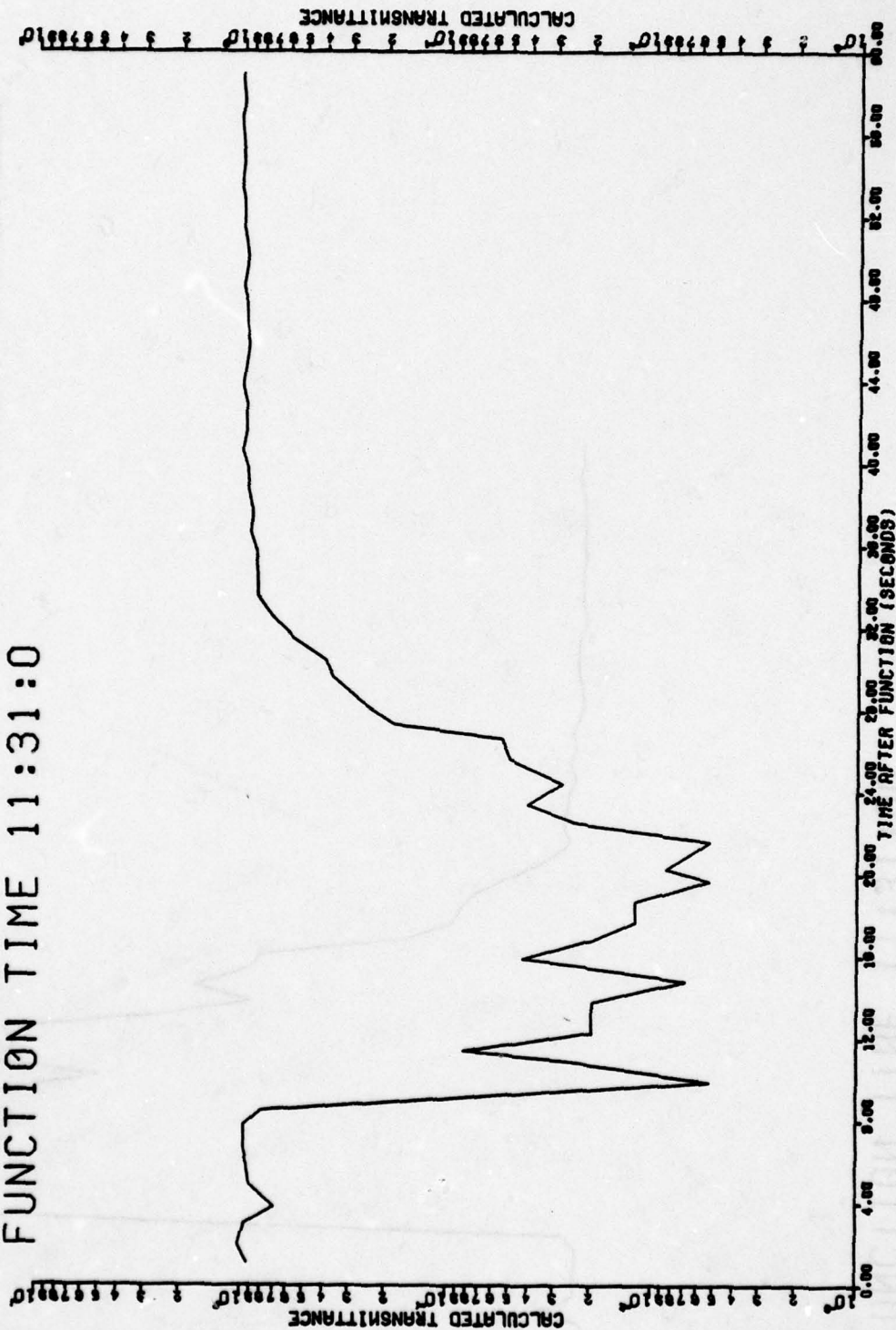
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #4 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:31:0



CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #4 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:31:0



CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

AD-A066 377

ARMY DUGWAY PROVING GROUND UTAH  
DUST/DEBRIS TEST CONDUCTED AT FORT SILL, OKLAHOMA BY DUGWAY PRO--ETC(U)  
SEP 78

F/G 19/4

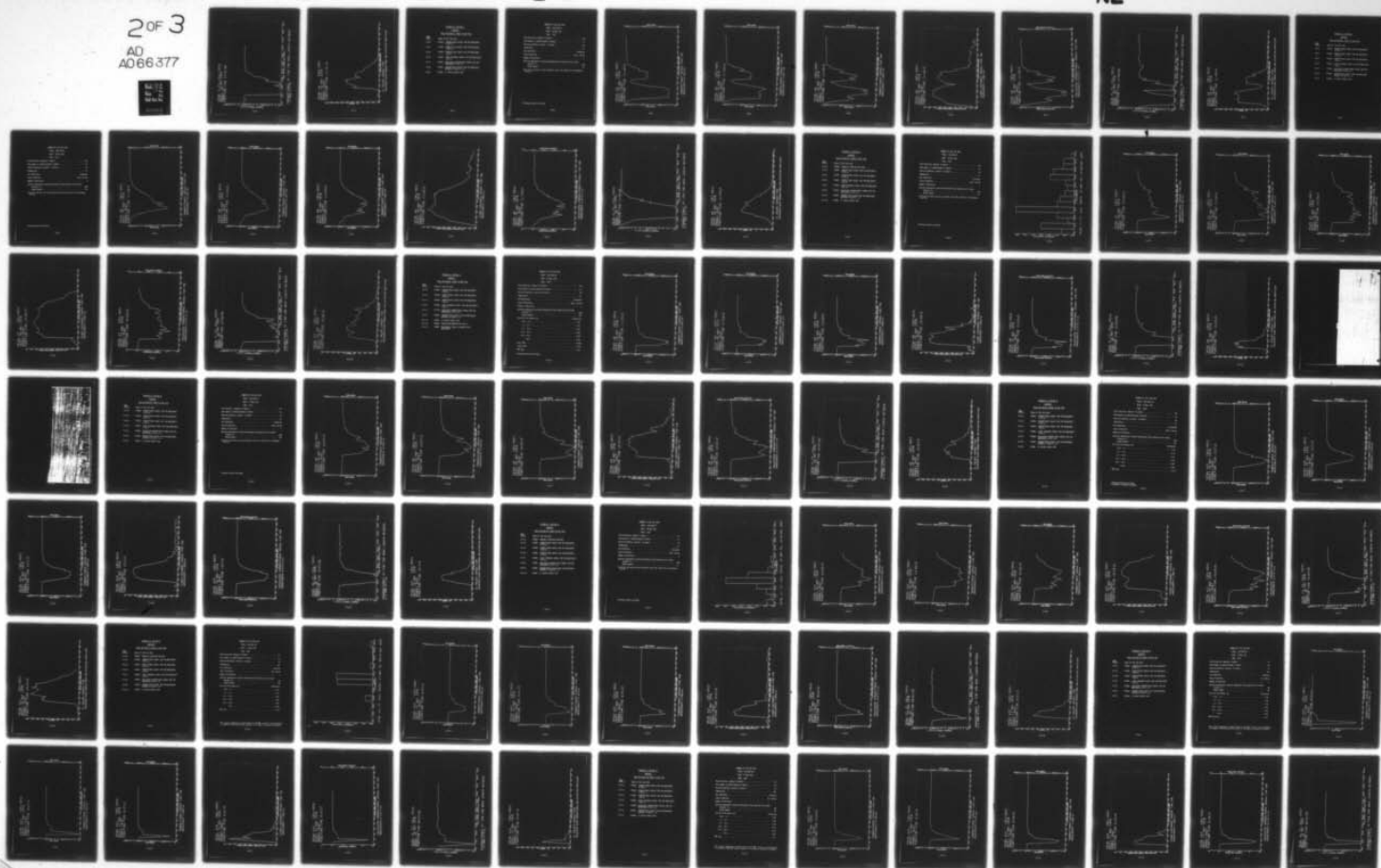
UNCLASSIFIED

DP6-FR-78-313-VOL-1

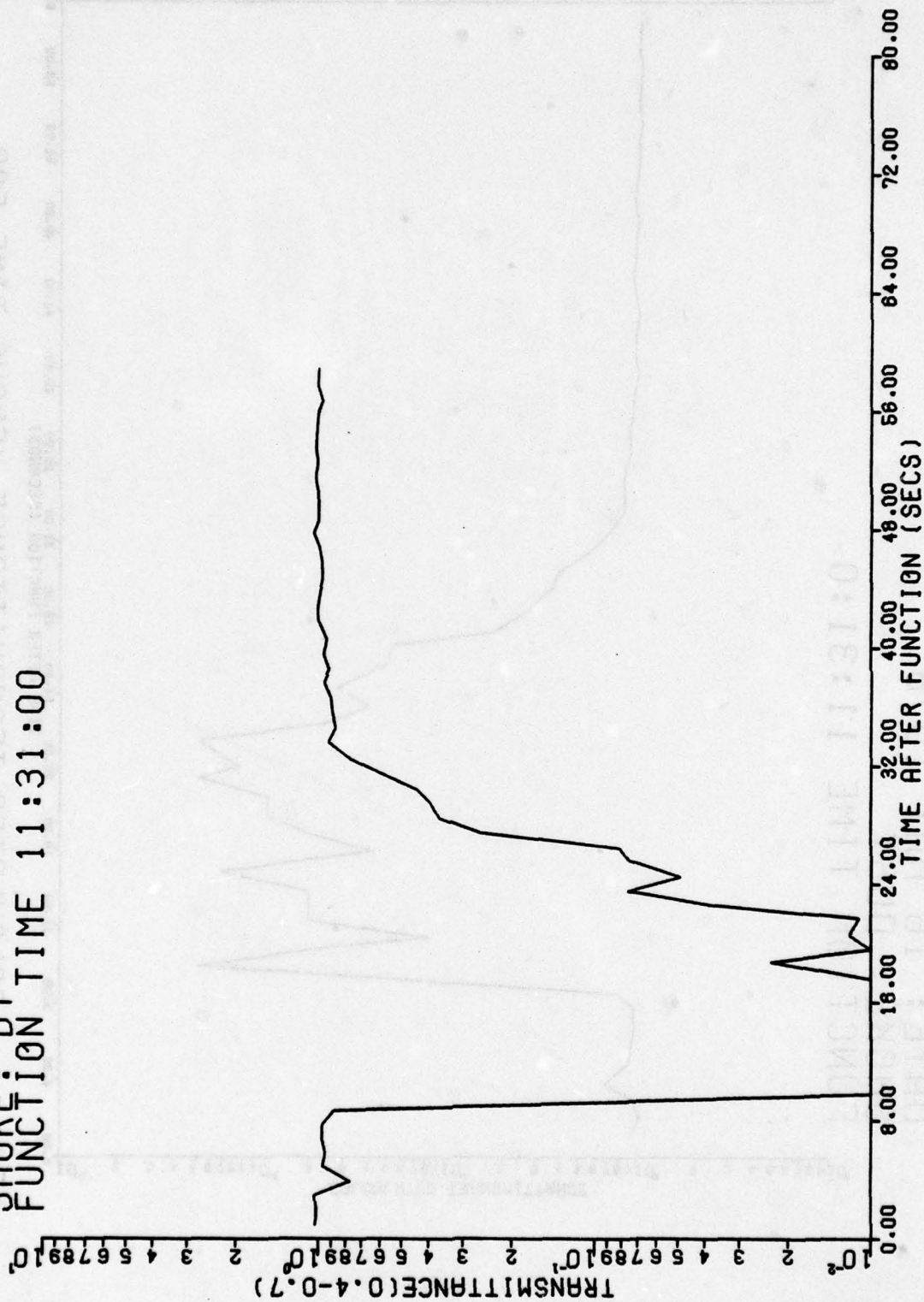
NL

2 OF 3

AD  
A066377



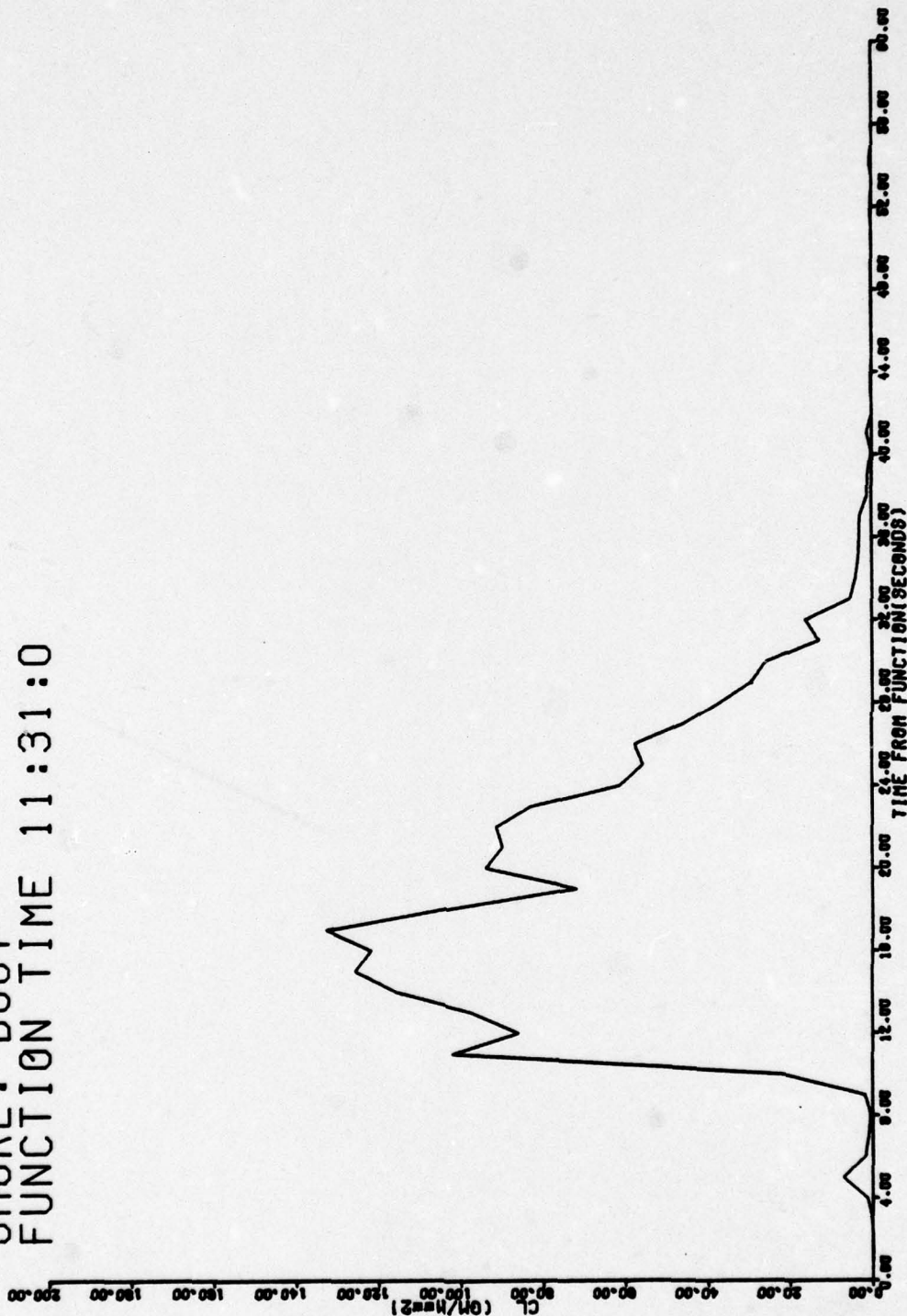
TRIAL 4: FT. SILL TESTS  
DATE: 16 MAY 1978  
SMOKE: DT  
FUNCTION TIME 11:31:00



B-7-8

TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #4 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:31:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 8

CONTENTS

TRIAL DPI-005-T5 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-8-2	TABLE OF TEST DAY DATA
B-8-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-8-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-8-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-8-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-8-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-8-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-8-9	FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T5

DATE: 16 May 1978

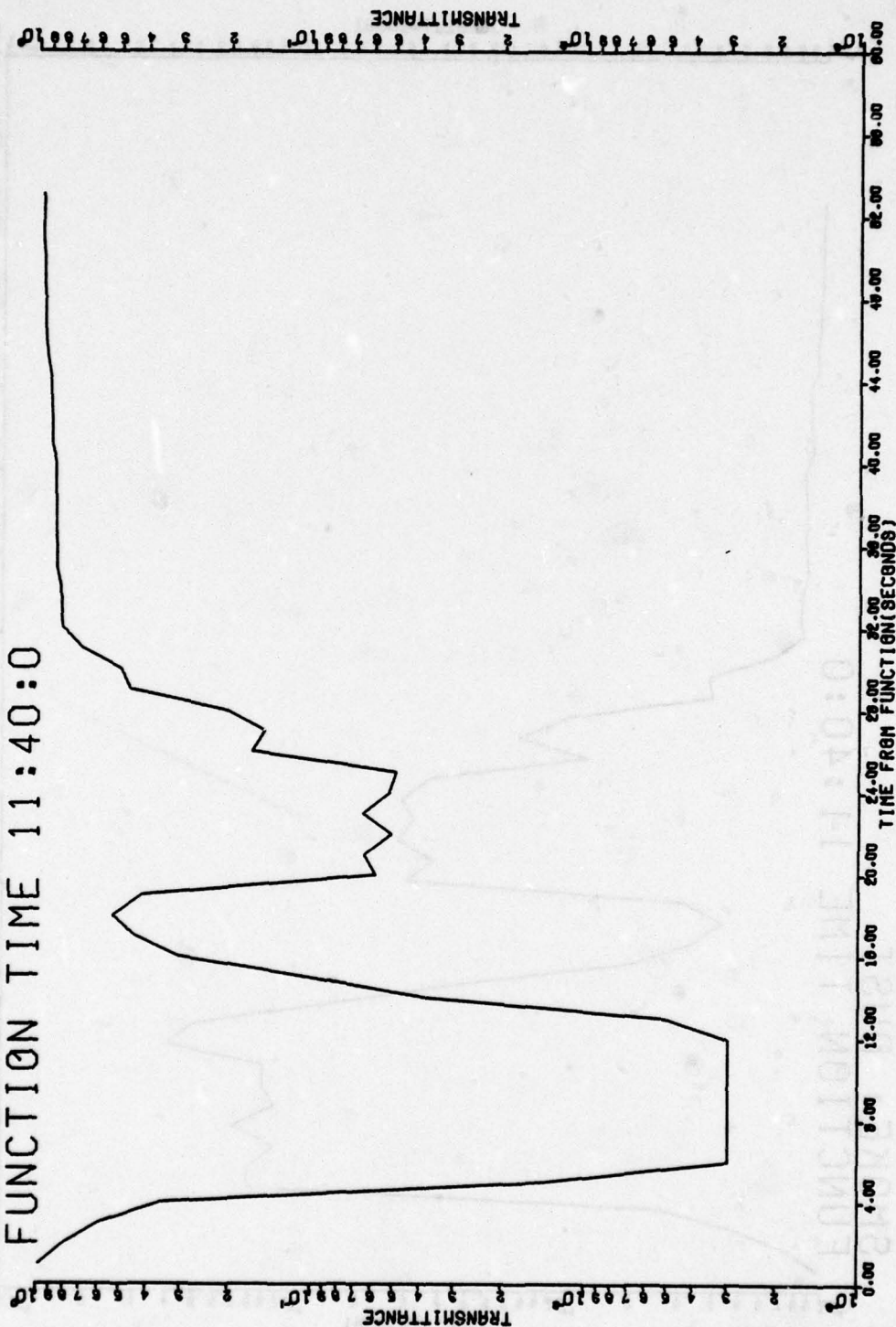
TIME: 1140

Wind Direction, degrees (2 meter) . . . . .	129
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	7.9
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	71°
Sky Conditions . . . . .	scattered
Type of Munition . . . . .	M107, 155 mm
Number of Munitions . . . . .	3
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	100*
Range (meter) . . . . .	50

Particle size data are not available since the cloud did not encompass the PSA.

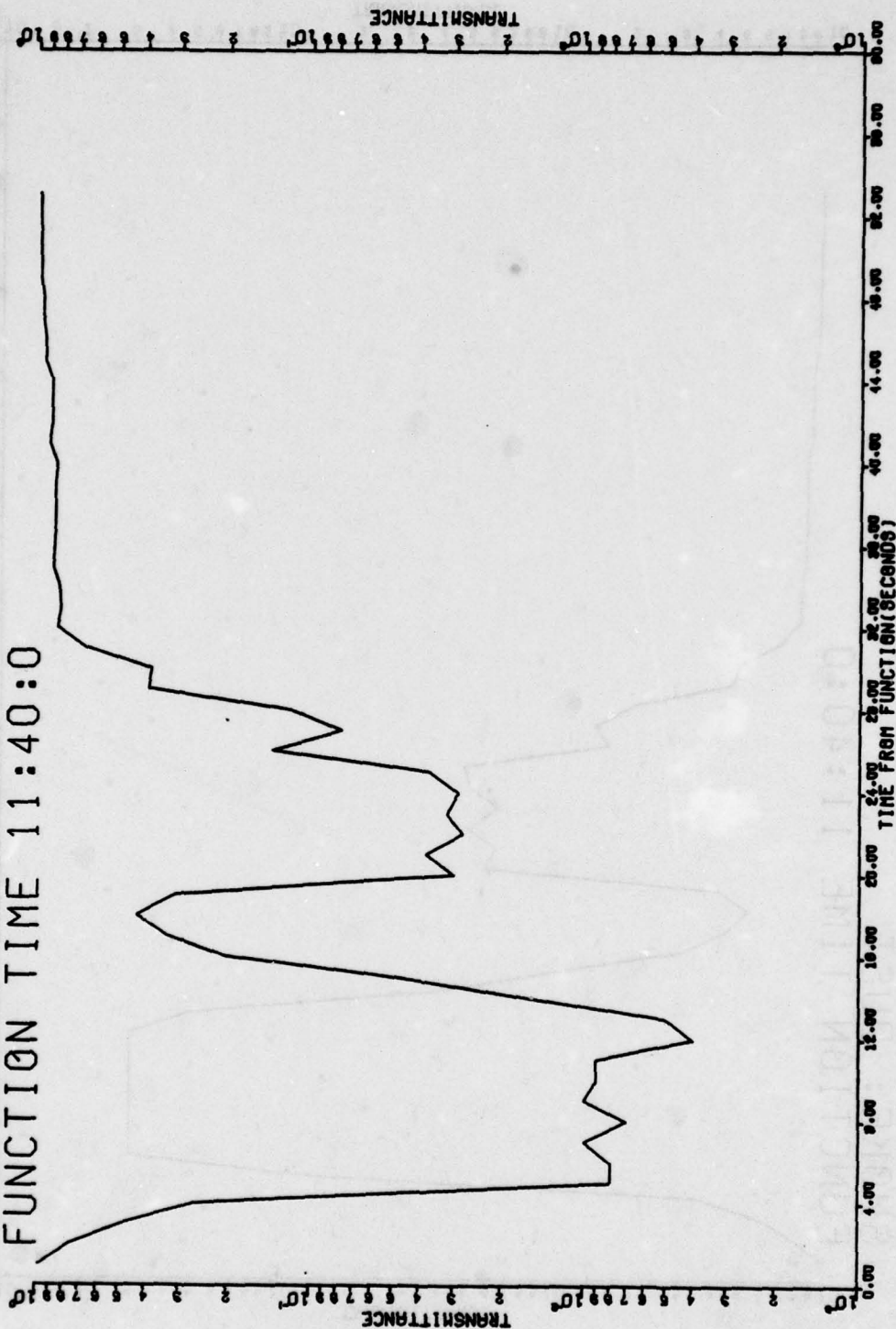
\*Average Azimuth and Range

TRIAL #5 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:40:0



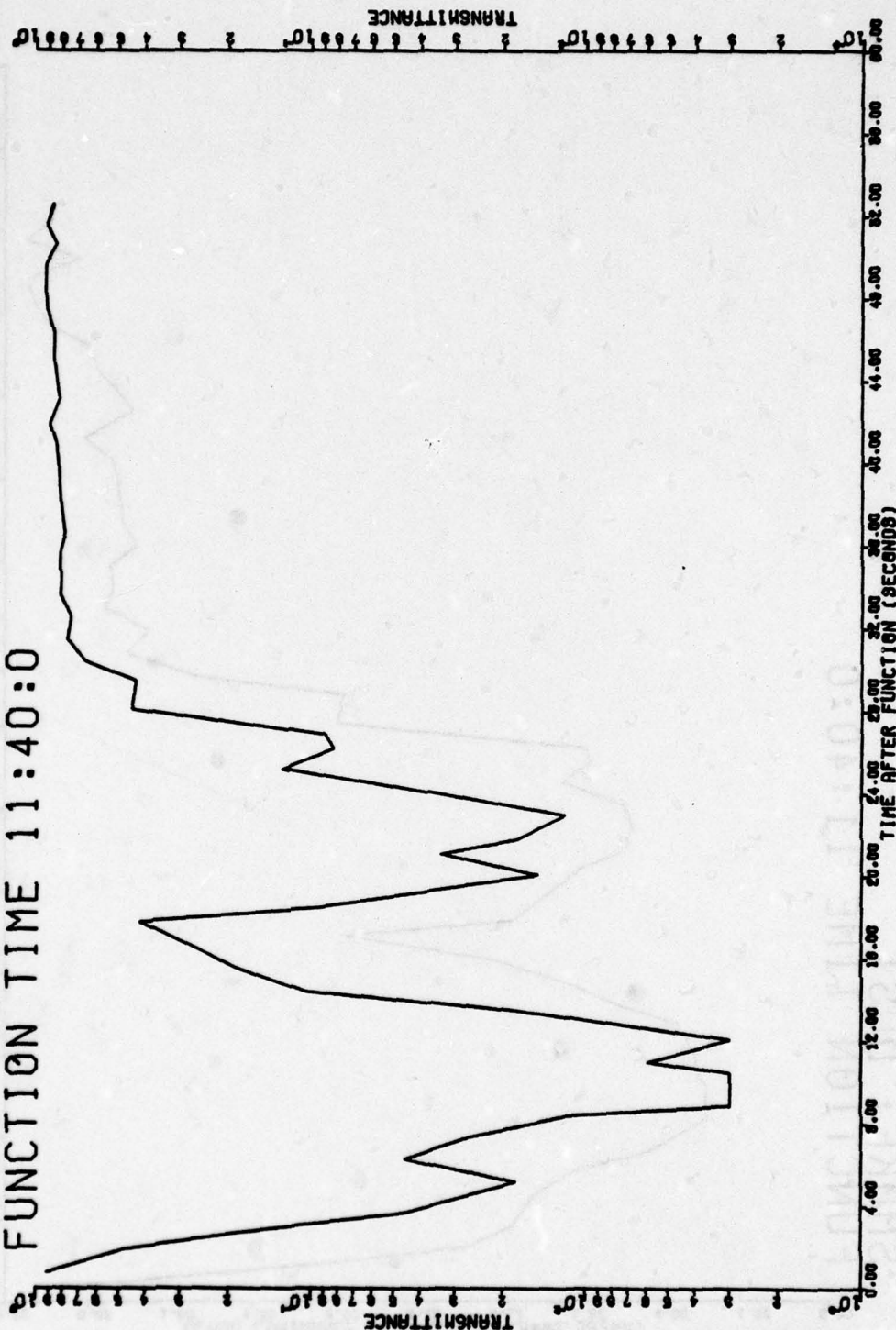
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #5 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:40:0



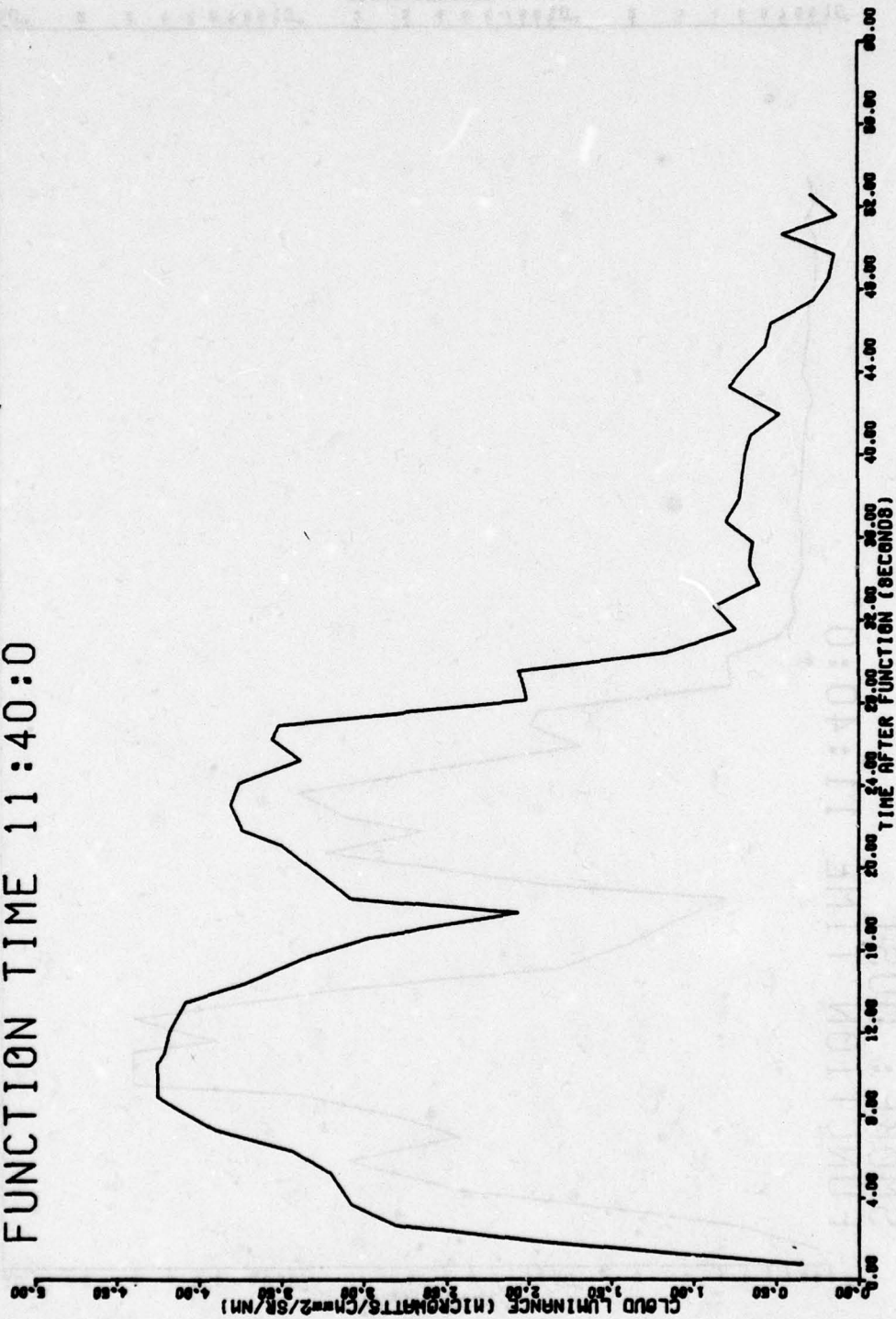
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #5 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:40:0



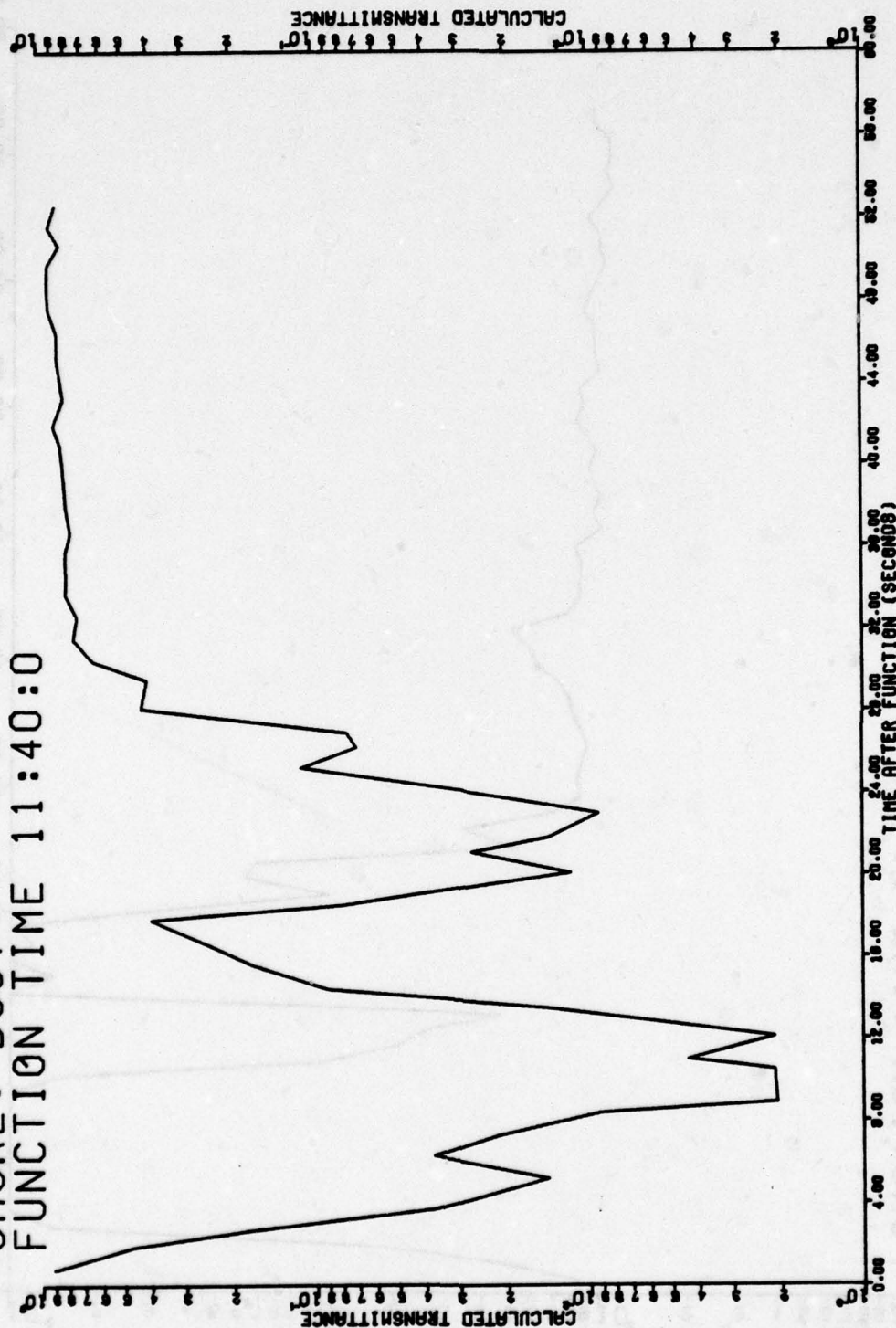
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #5 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:40:0

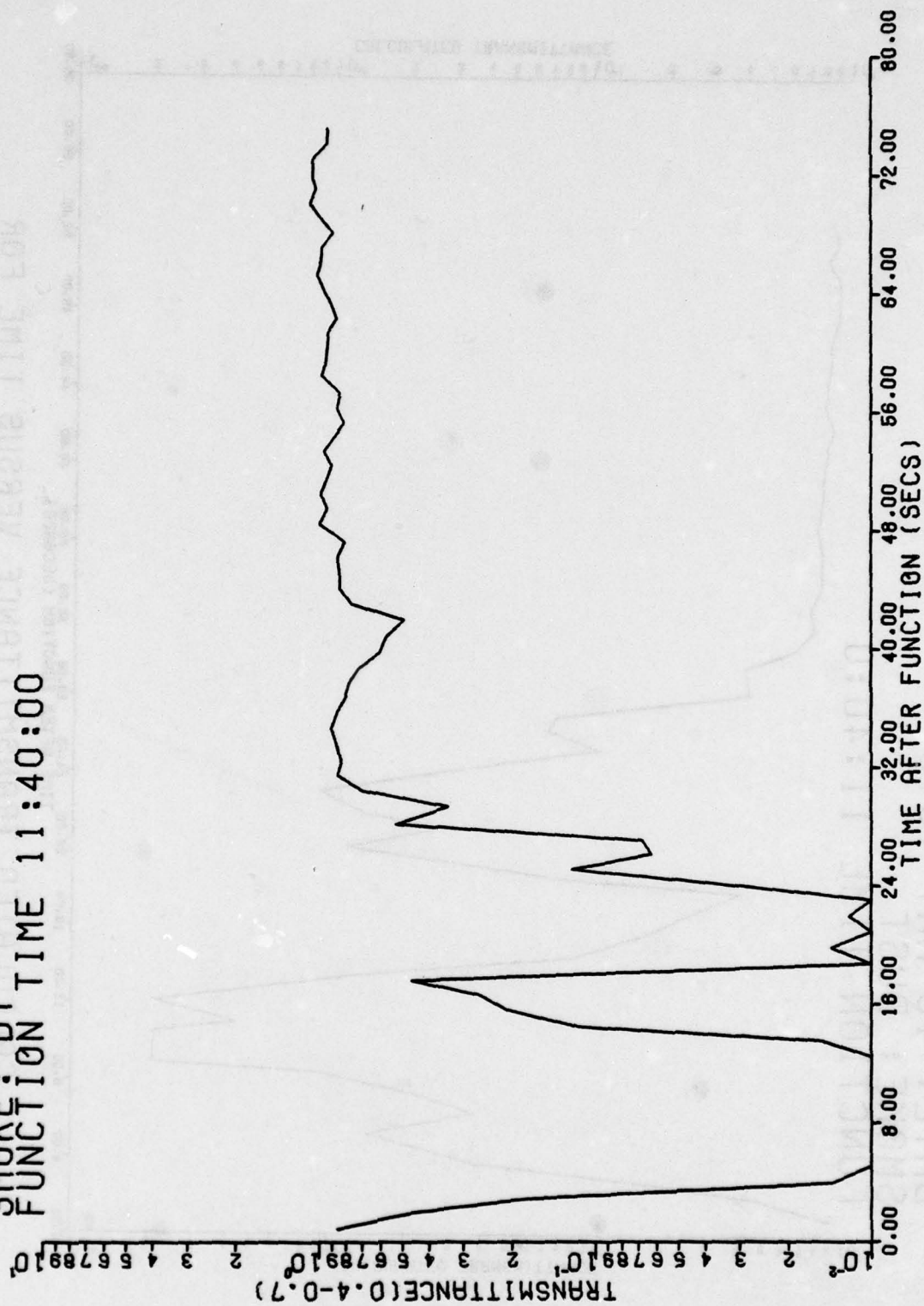


CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #5 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:40:0

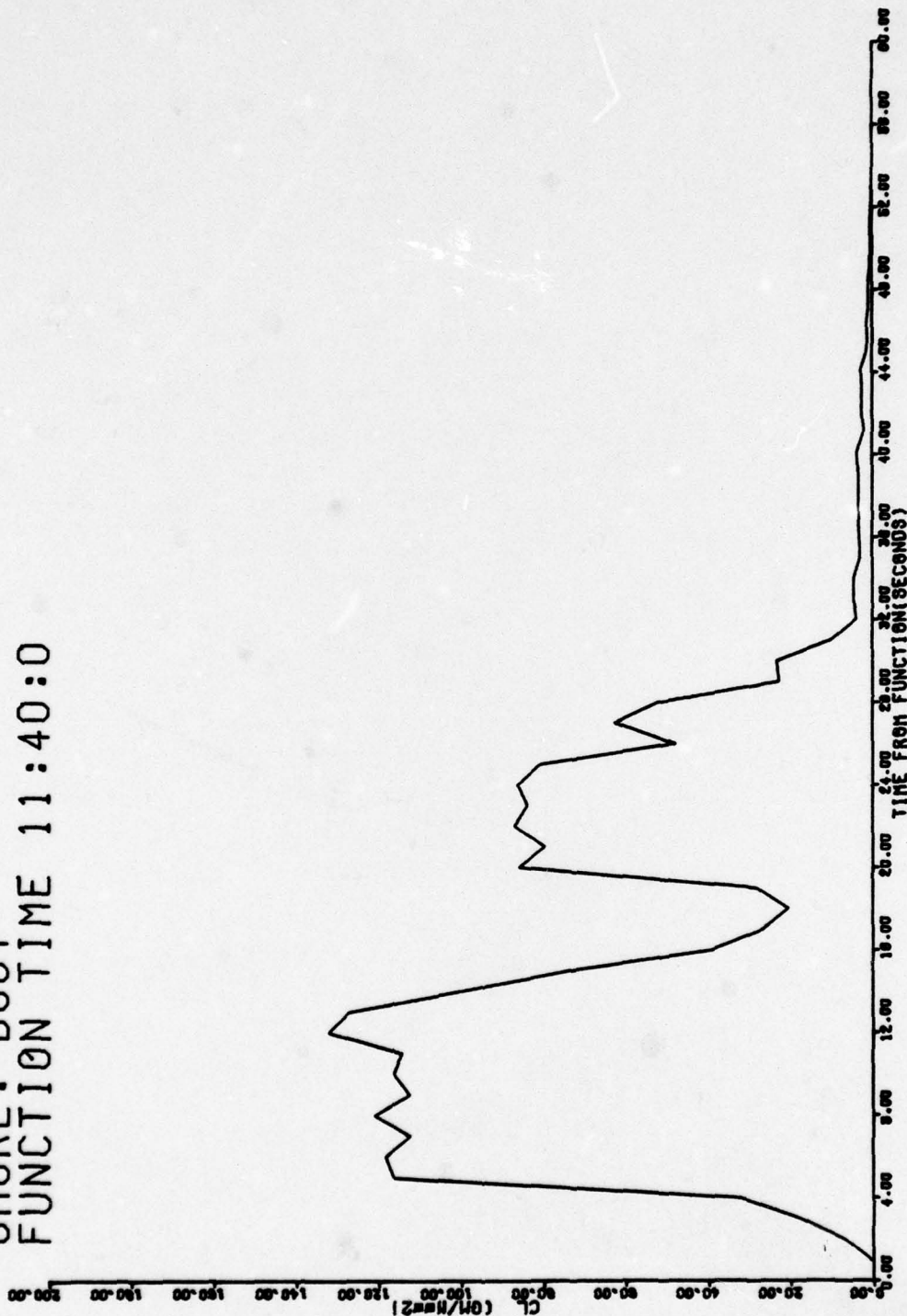


TRIAL 5, FT. SILL TESTS  
 DATE: 16 MAY 1978  
 SMOKE: 0T  
 FUNCTION TIME 11:40:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #5 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:40:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 9

CONTENTS

TRIAL DPI-005-T6 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-9-2	TABLE OF TEST DAY DATA
B-9-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-9-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-9-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-9-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-9-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-9-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-9-9	FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T6

DATE: 16 May 1978

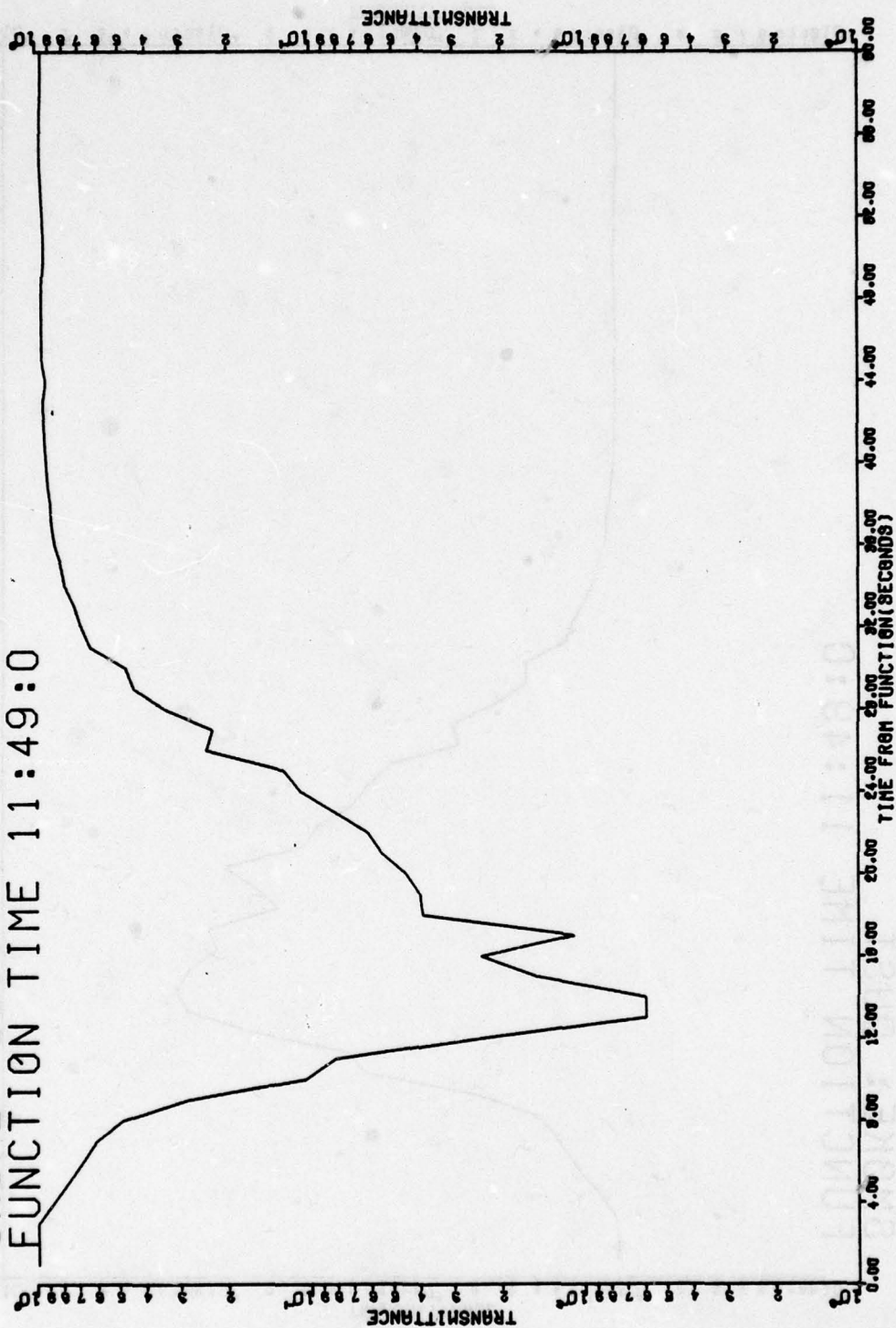
TIME: 1149

Wind Direction, degrees (2 meter) . . . . .	122
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	8.1
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	71°
Sky Conditions. . . . .	scattered
Type of Munition . . . . .	M107, 155 mm
Number of Munitions . . . . .	3
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	084*
Range (meter) . . . . .	116

Particle size data are not available since the cloud did not encompass the PSA.

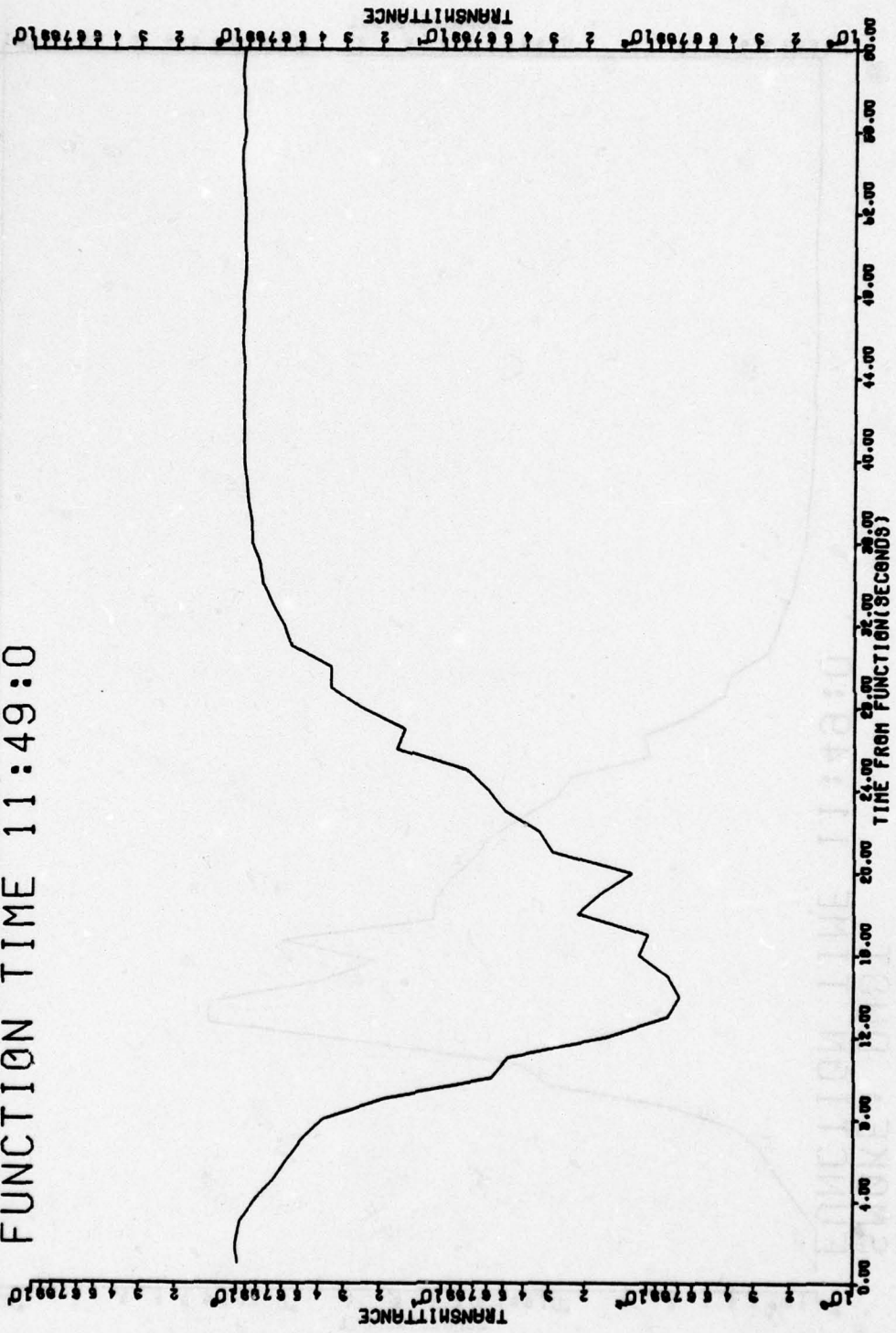
\*Average Azimuth and Range

TRIAL #6 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:49:0



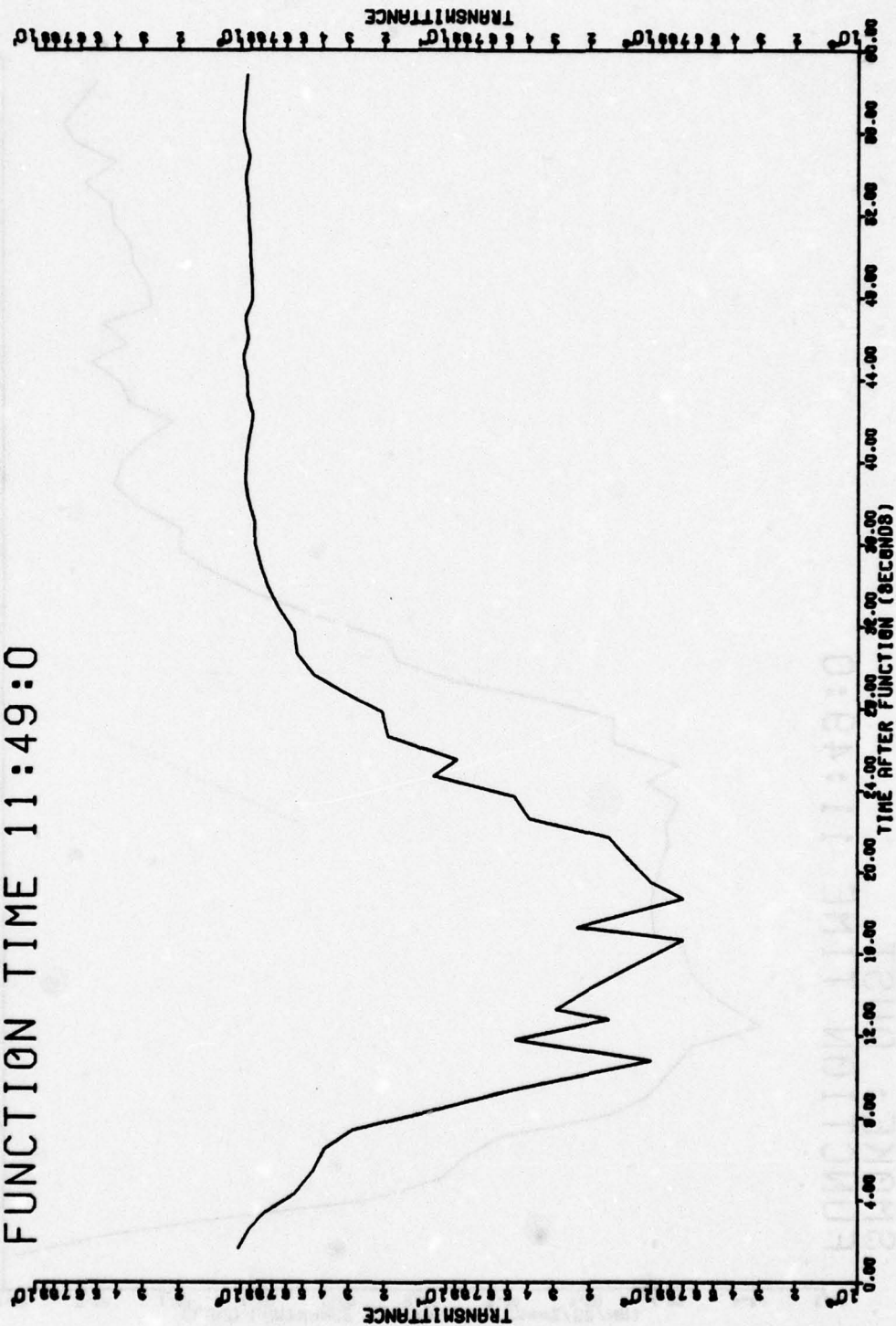
TRANSMITTANCE VERSUS TIME FOR  
 WAVELENGTH 9.750 (μm)

TRIAL #6 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:49:0



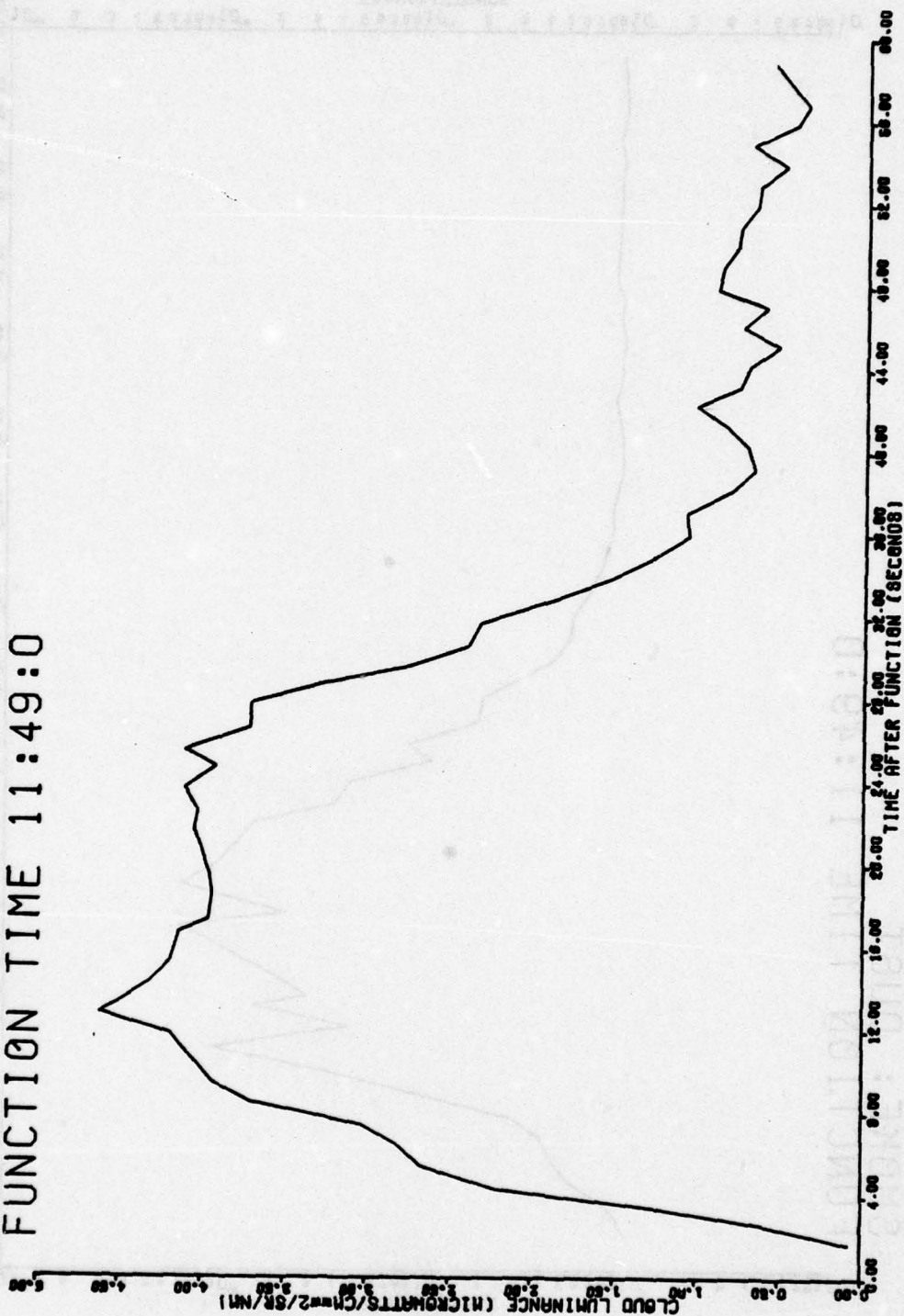
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 (um)

TRIAL #6 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:49:0



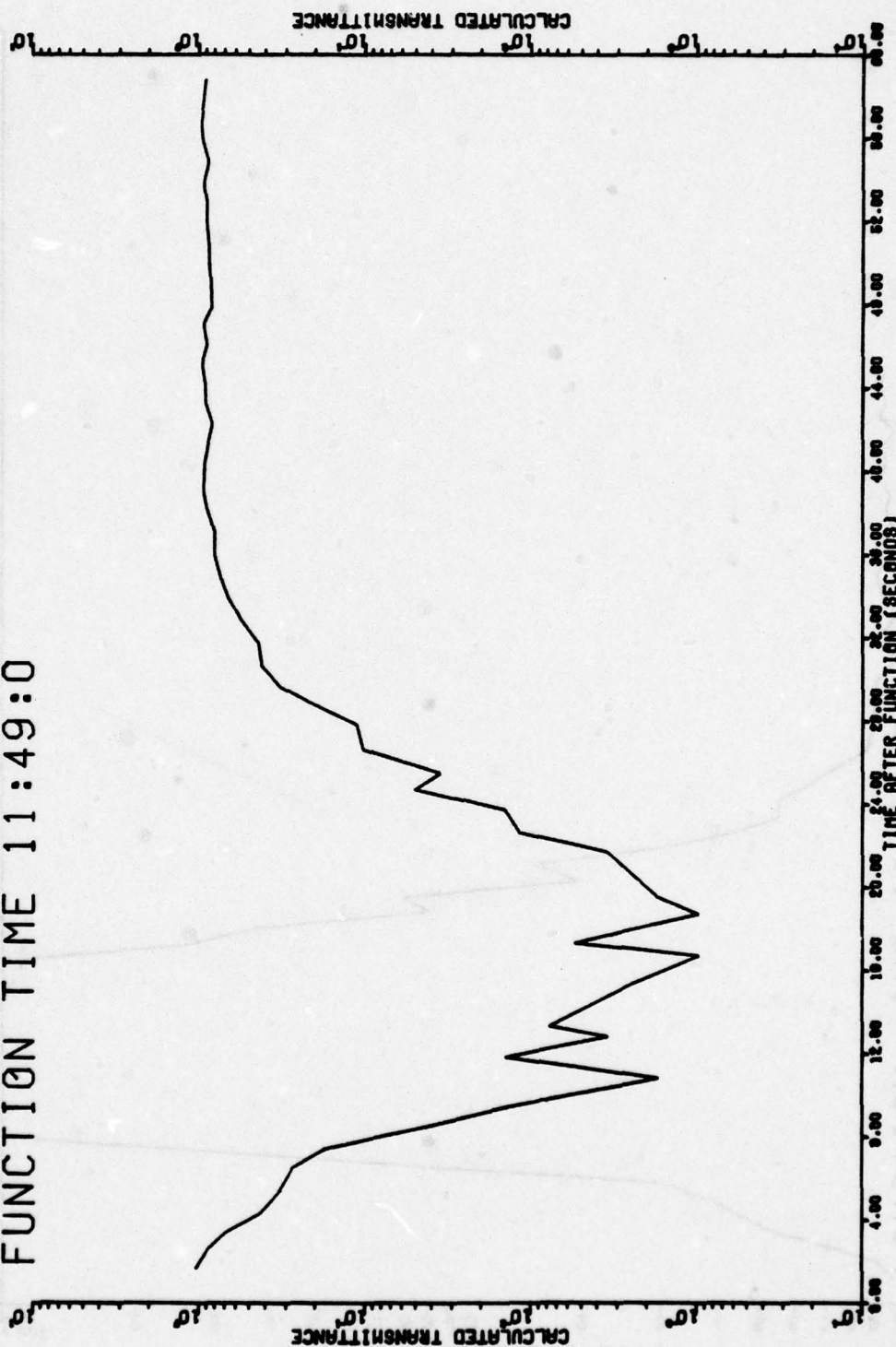
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #6 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:49:0



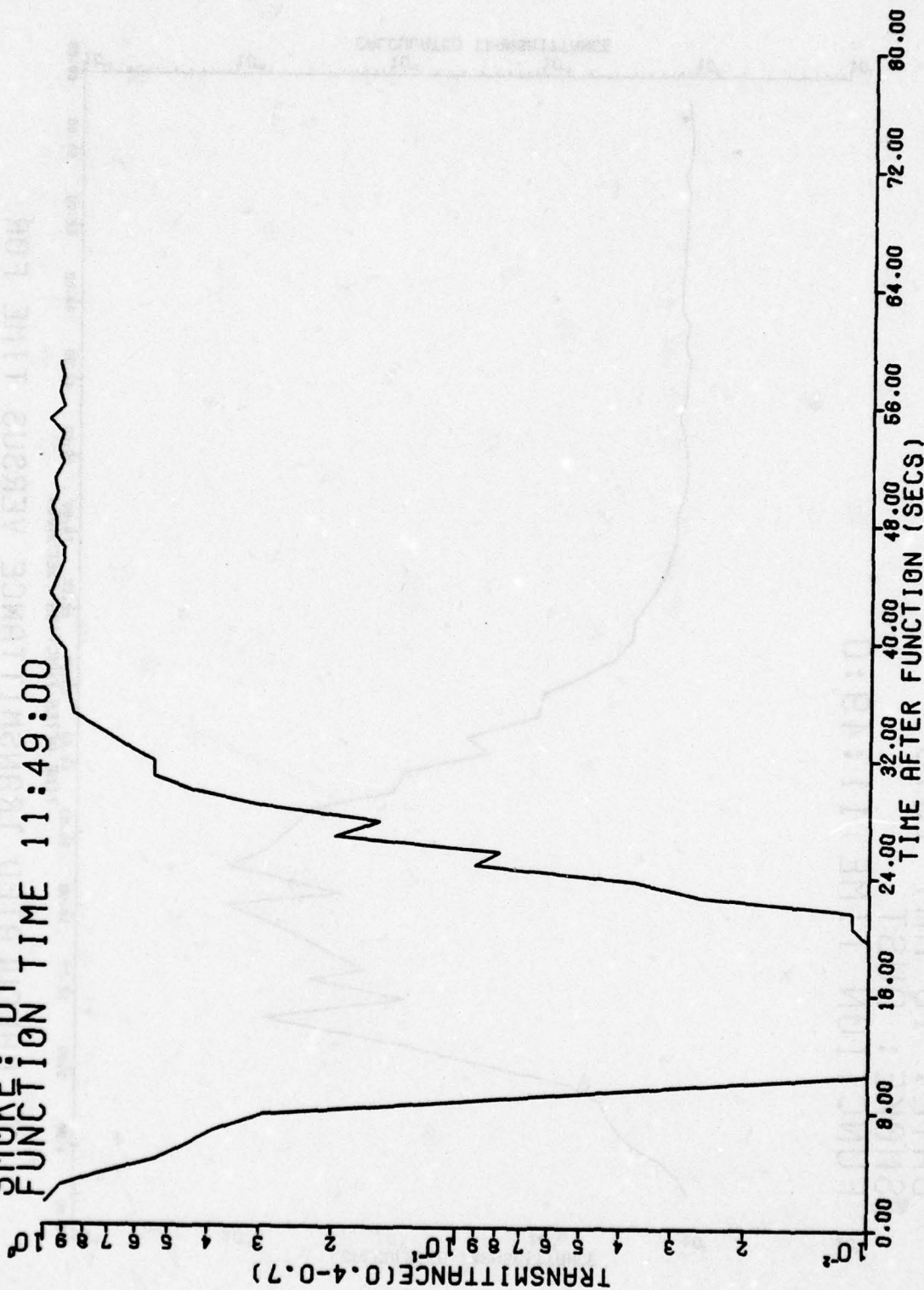
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #6 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:49:0



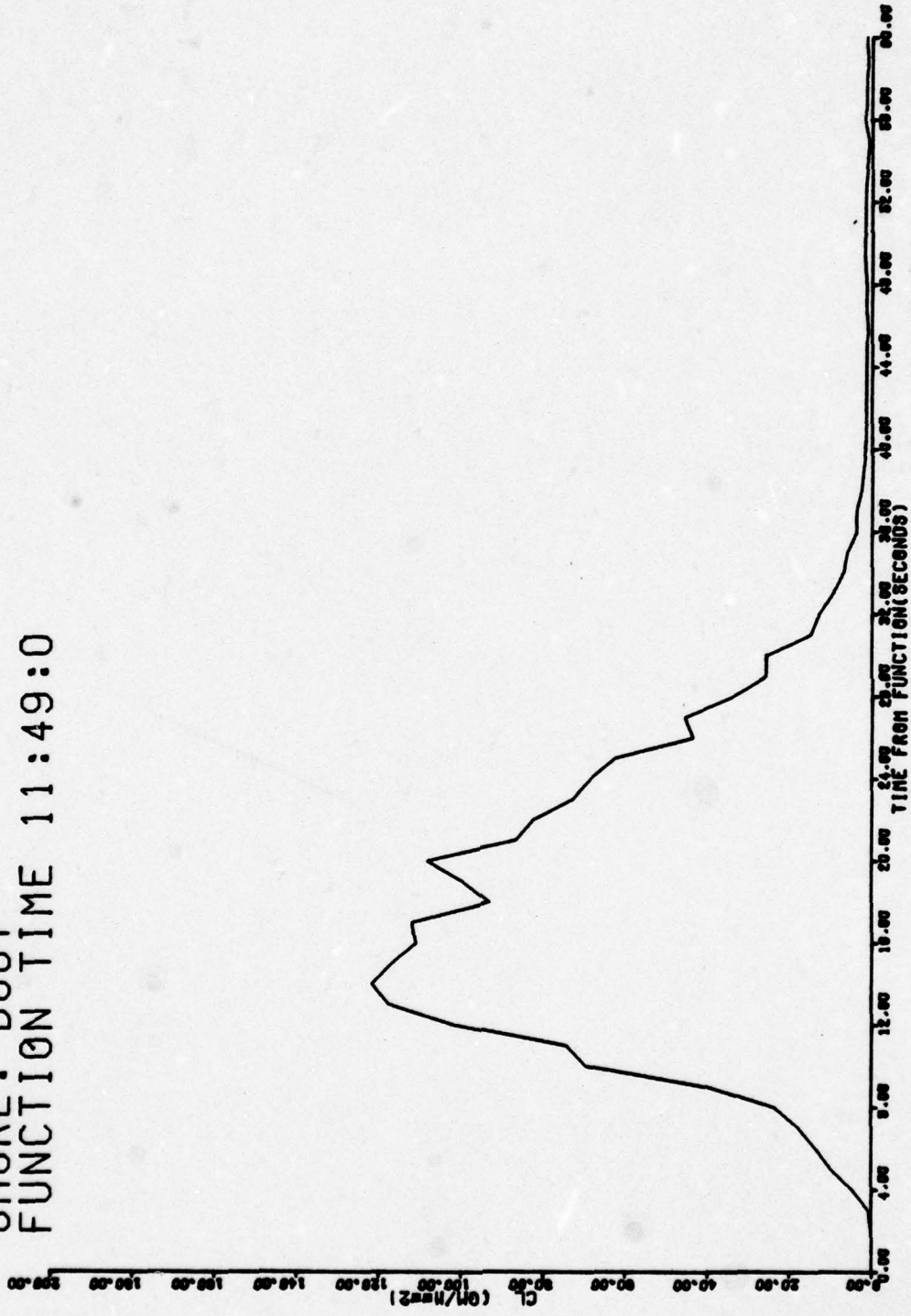
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 (μm)

TRIAL 6: FT. SILL TESTS  
 DATE: 16 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 11:49:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #6 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:49:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 10

CONTENTS

TRIAL DPI-005-T7 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-10-2	TABLE OF TEST DAY DATA
B-10-3	FIGURE: DOSAGE BY SAMPLING POSITION
B-10-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-10-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-10-6	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-10-7	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-10-8	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-10-9	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-10-10	FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T7

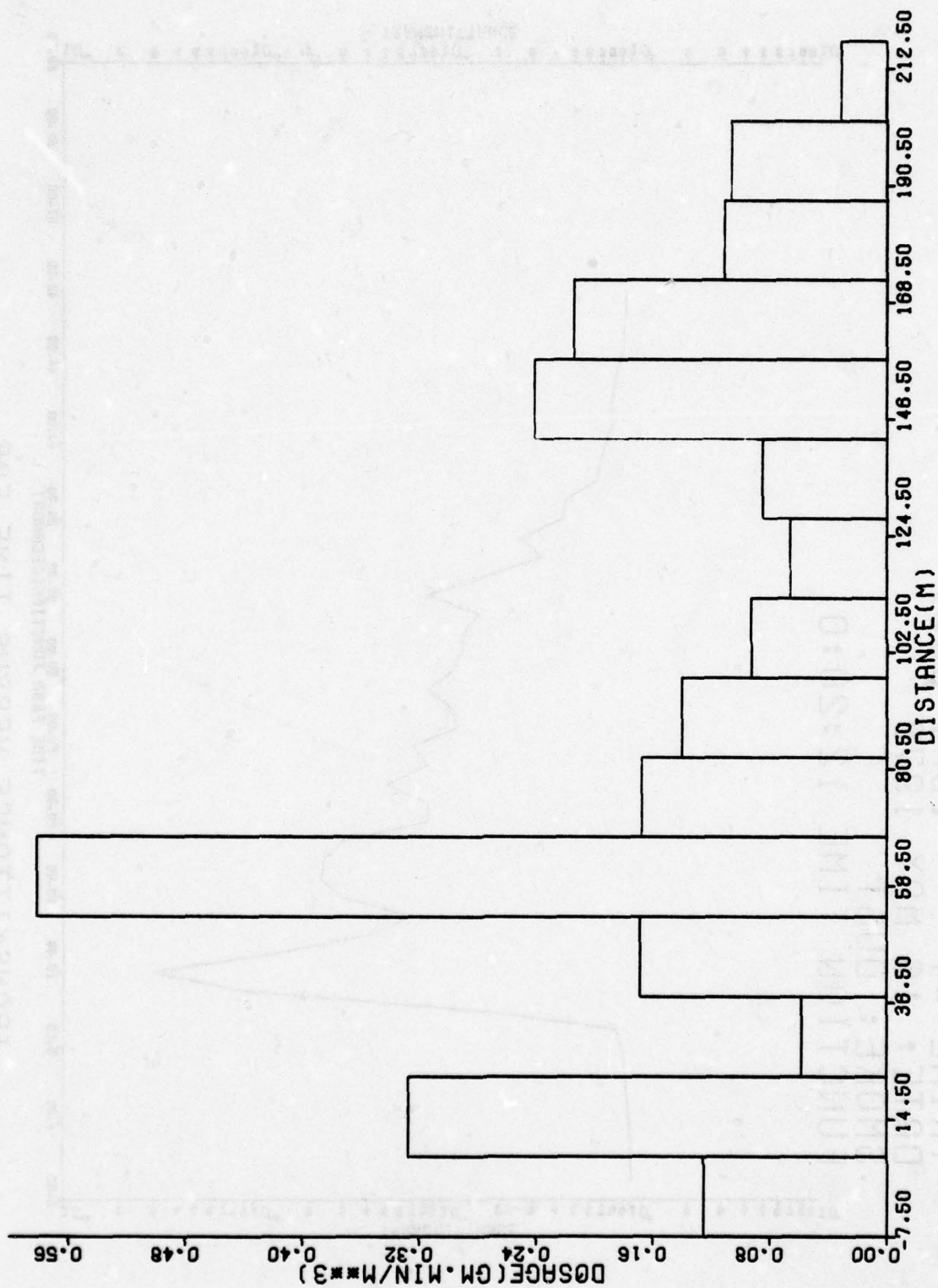
DATE: 16 May 1978

TIME: 1220

Wind Direction, degrees (2 meter) . . . . .	128
Wind Speed, $\bar{u}$ , meters/second (2 meter). . . . .	7.6
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	71°
Sky Conditions . . . . .	scattered
Type of Munition . . . . .	M107, 155 mm
Number of Munitions . . . . .	3
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	120*
Range (meter) . . . . .	113

Particle size data are not available since the cloud did not encompass the PSA.

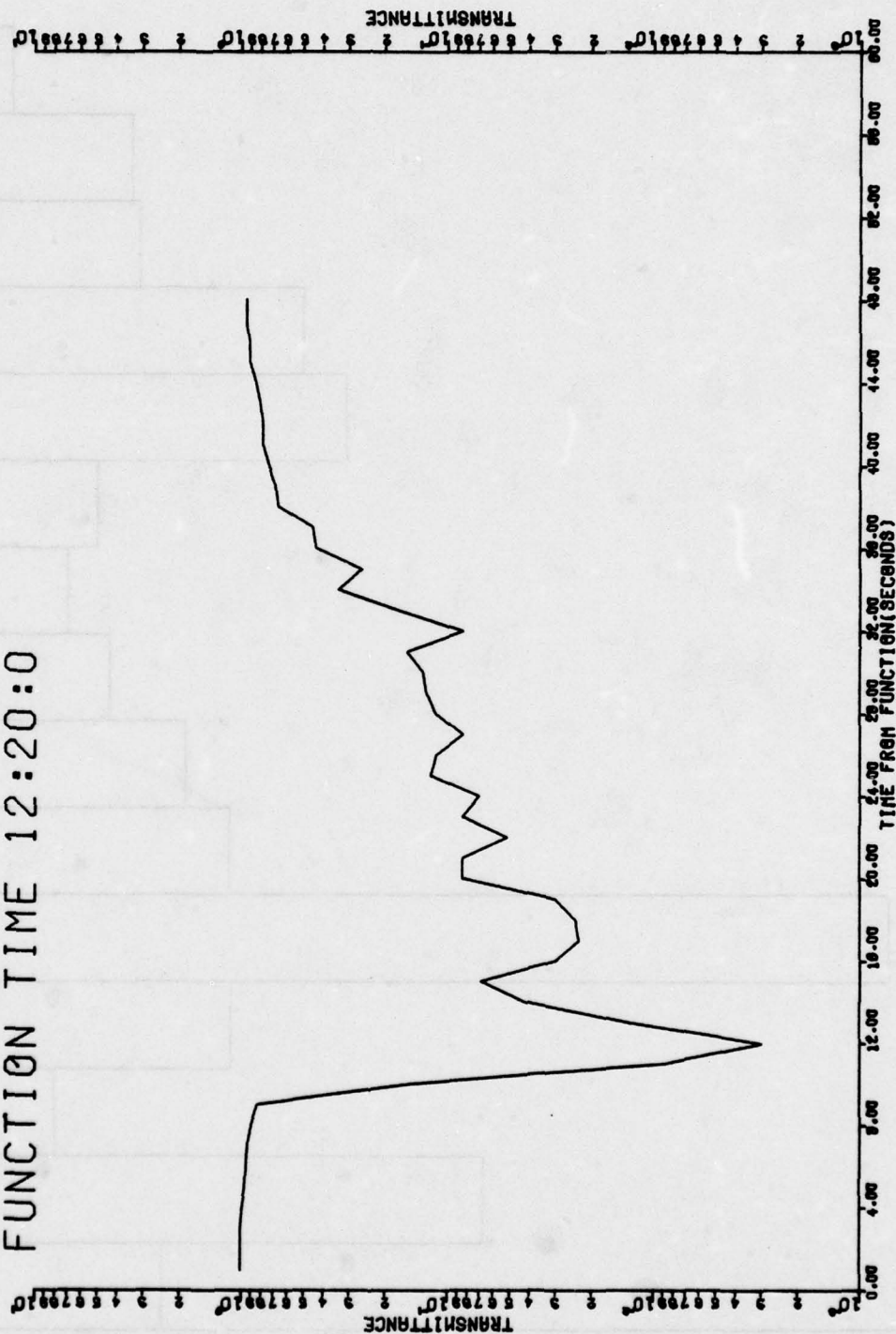
\*Average Azimuth and Range



B-10-3

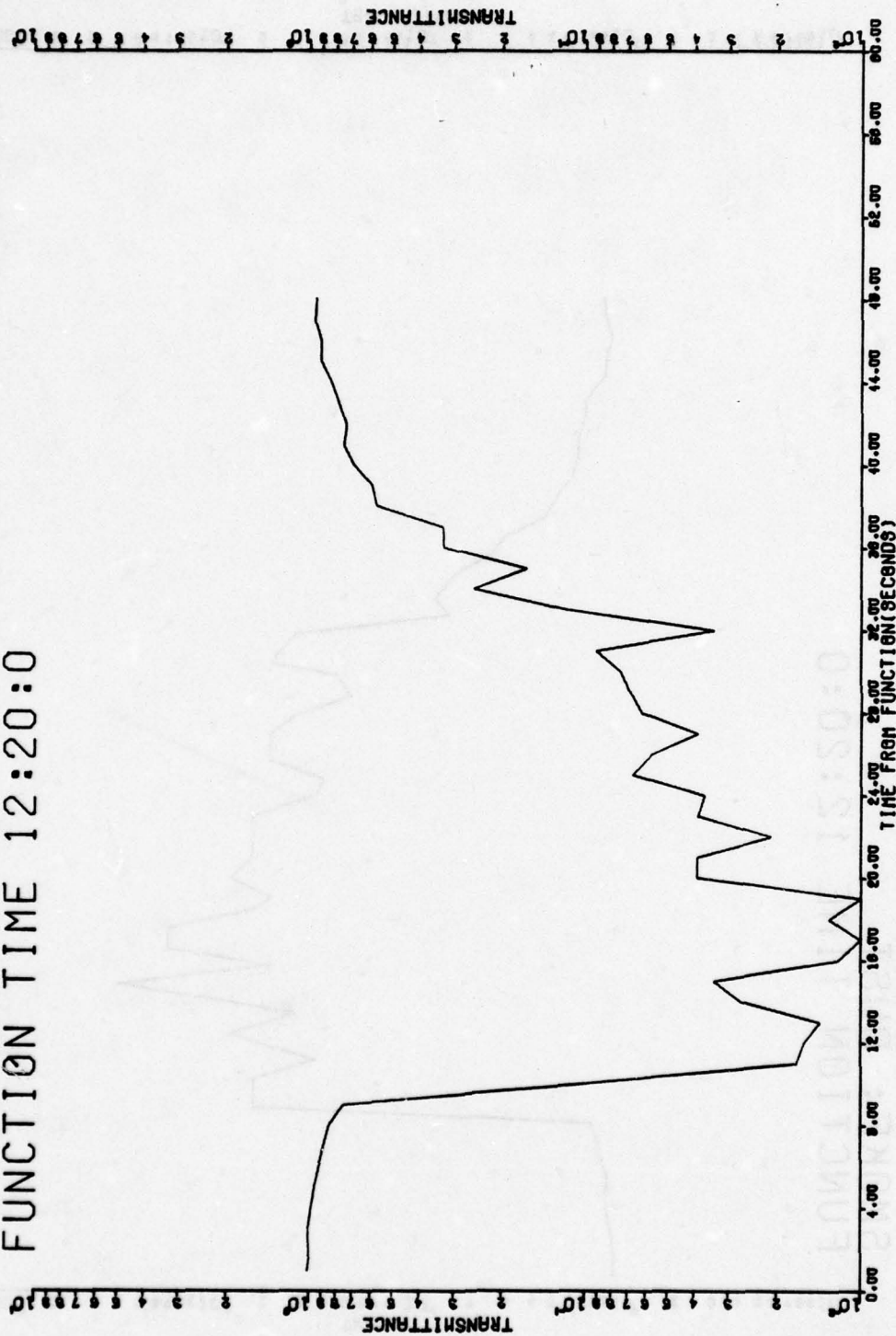
TRIAL 7, FT. SILL TESTS, 16 MAY 78, 12:20:00, DUST

TRIAL #7 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:20:0



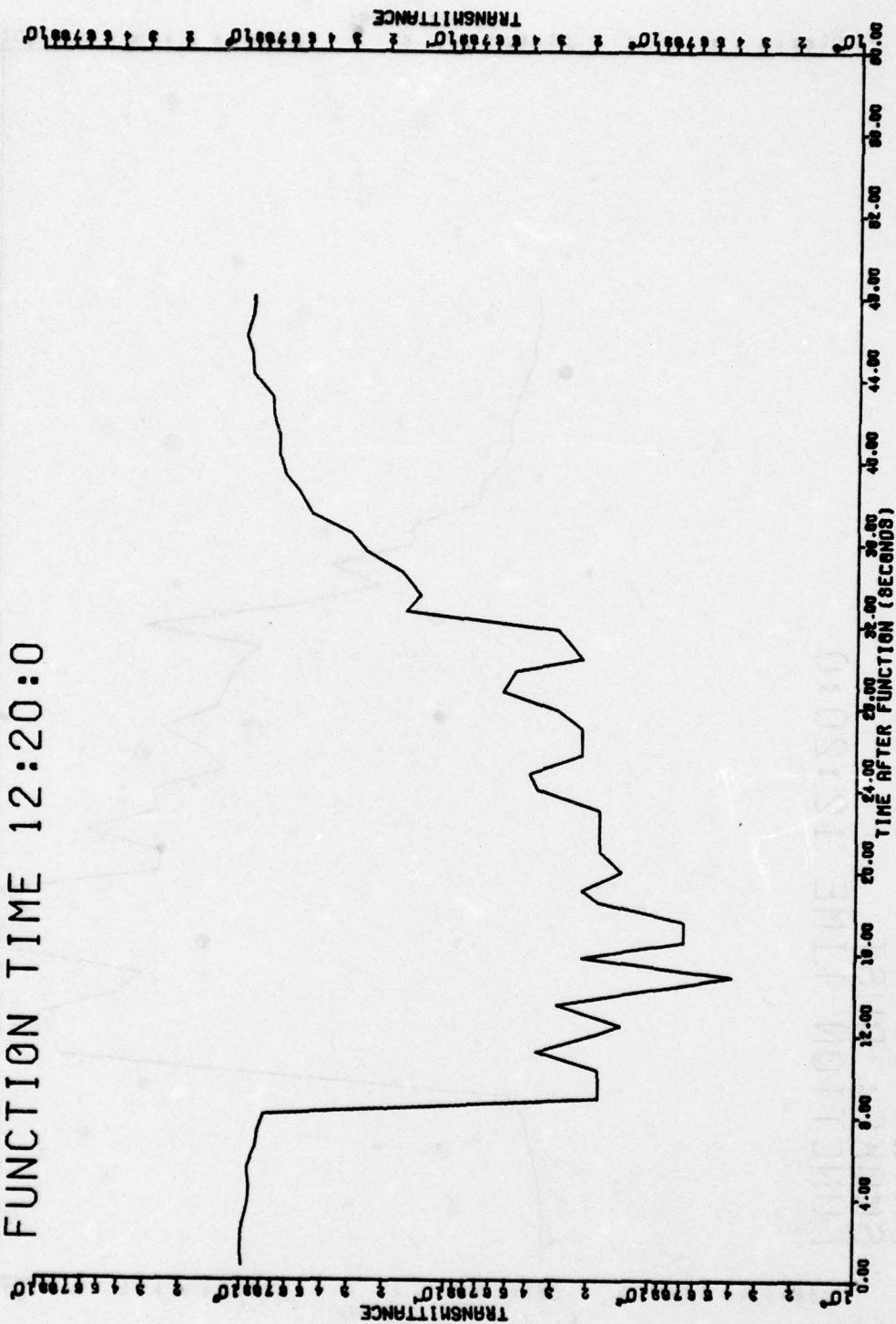
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #7 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:20:0



TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #7 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:20:0



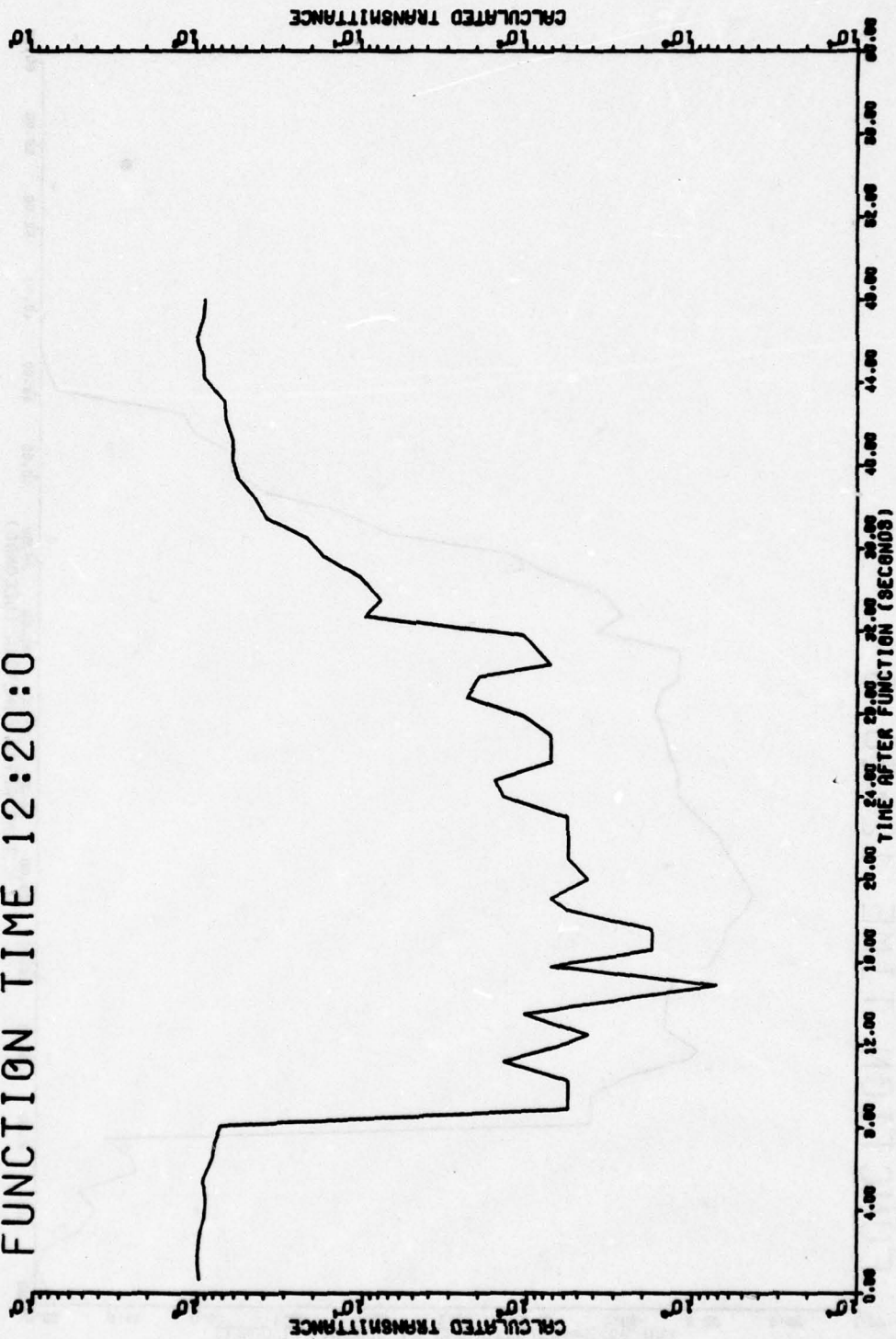
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #7 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:20:0



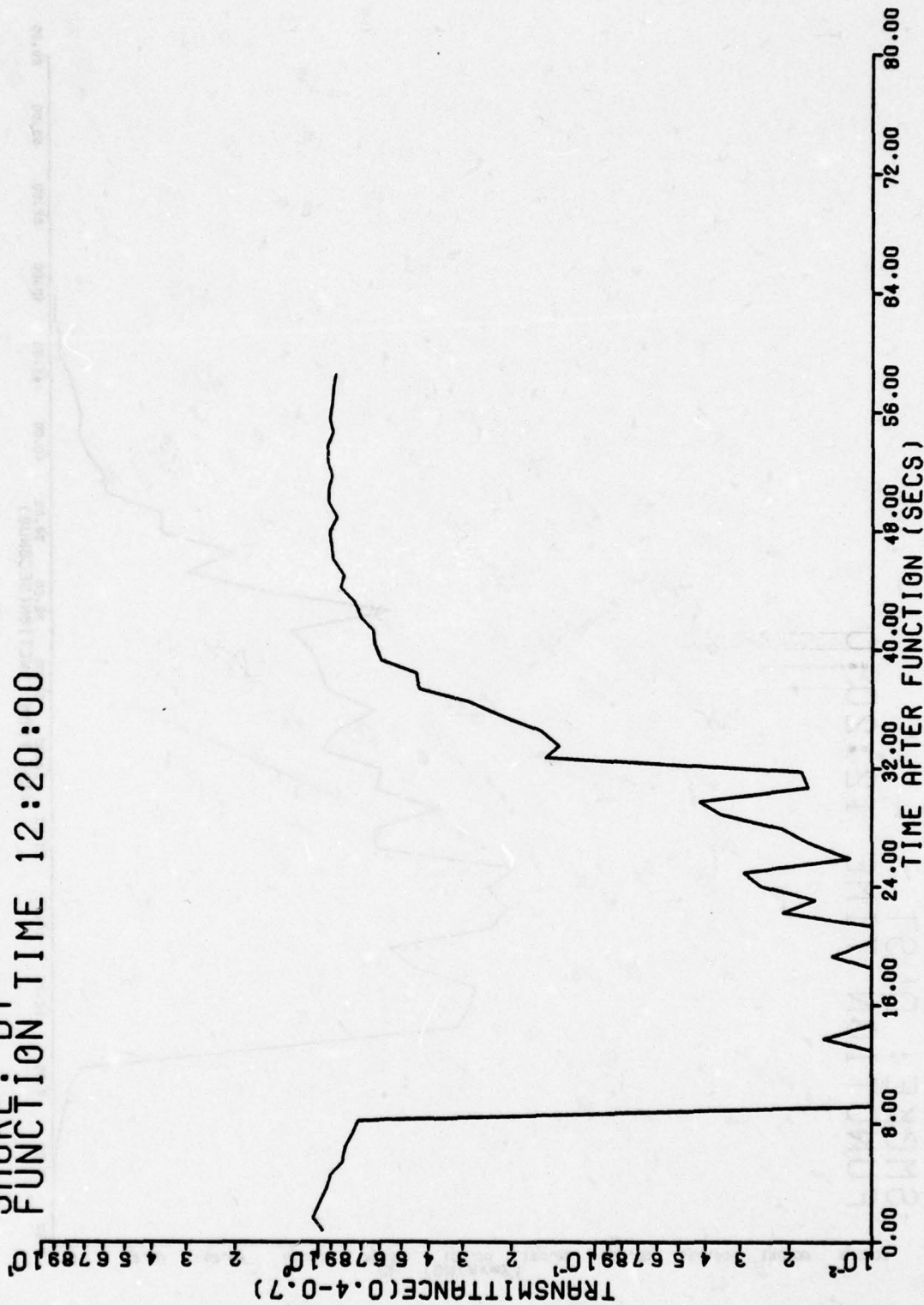
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #7 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:20:0



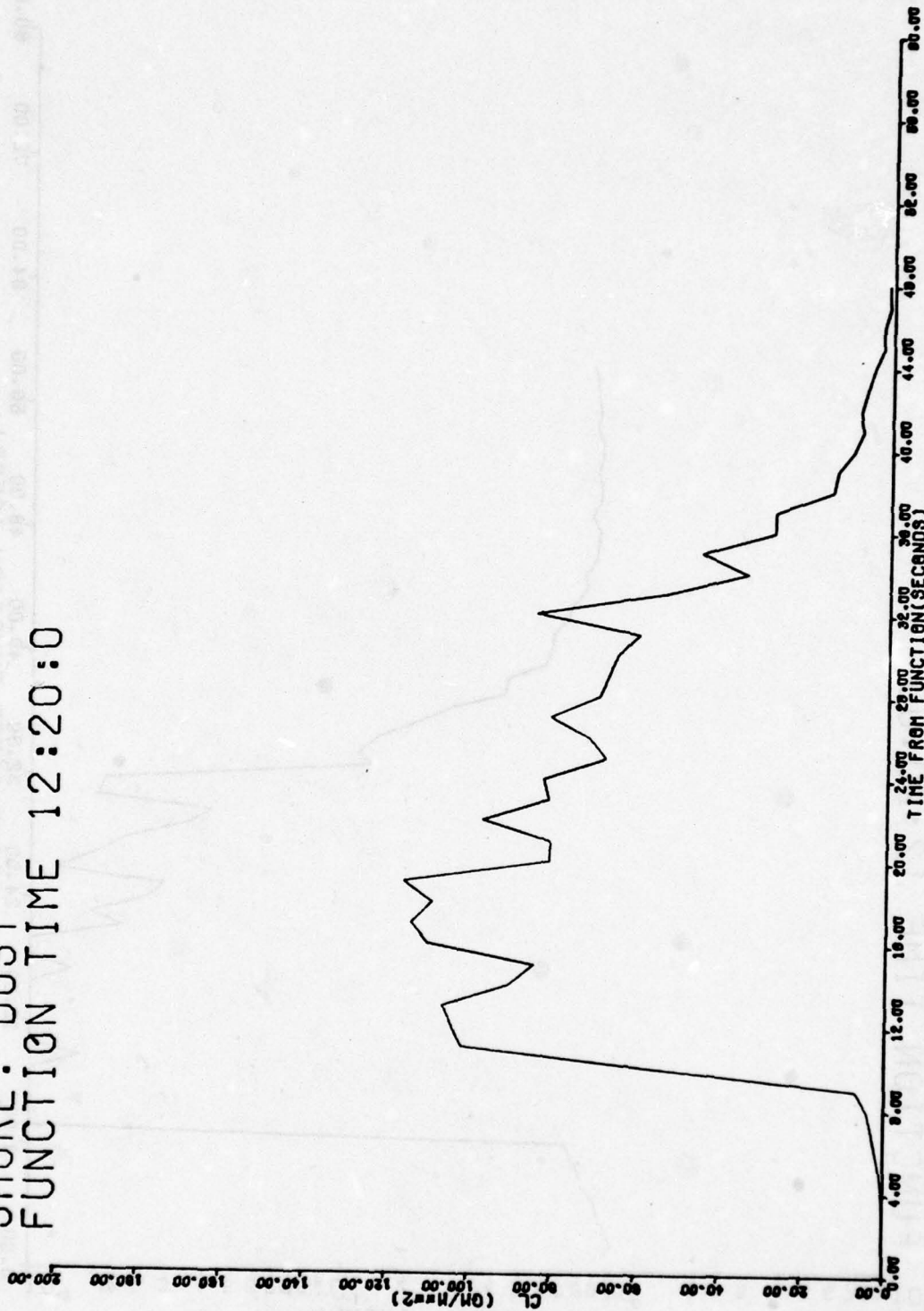
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 7: FT. SILL TESTS  
 DATE: 16 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 12:20:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #7 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 12:20:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 11

CONTENTS

TRIAL DPI-005-T8 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-11-2	TABLE OF TEST DAY DATA
B-11-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-11-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-11-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-11-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-11-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-11-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-11-9	FIGURE: CL VALUES VERSUS TIME
B-11-10	FIGURE: MUNITION DETONATION FOR TRIAL 8
B-11-11	FIGURE: DUST/DEBRIS CLOUD 10 SECONDS AFTER DETONATION

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T8

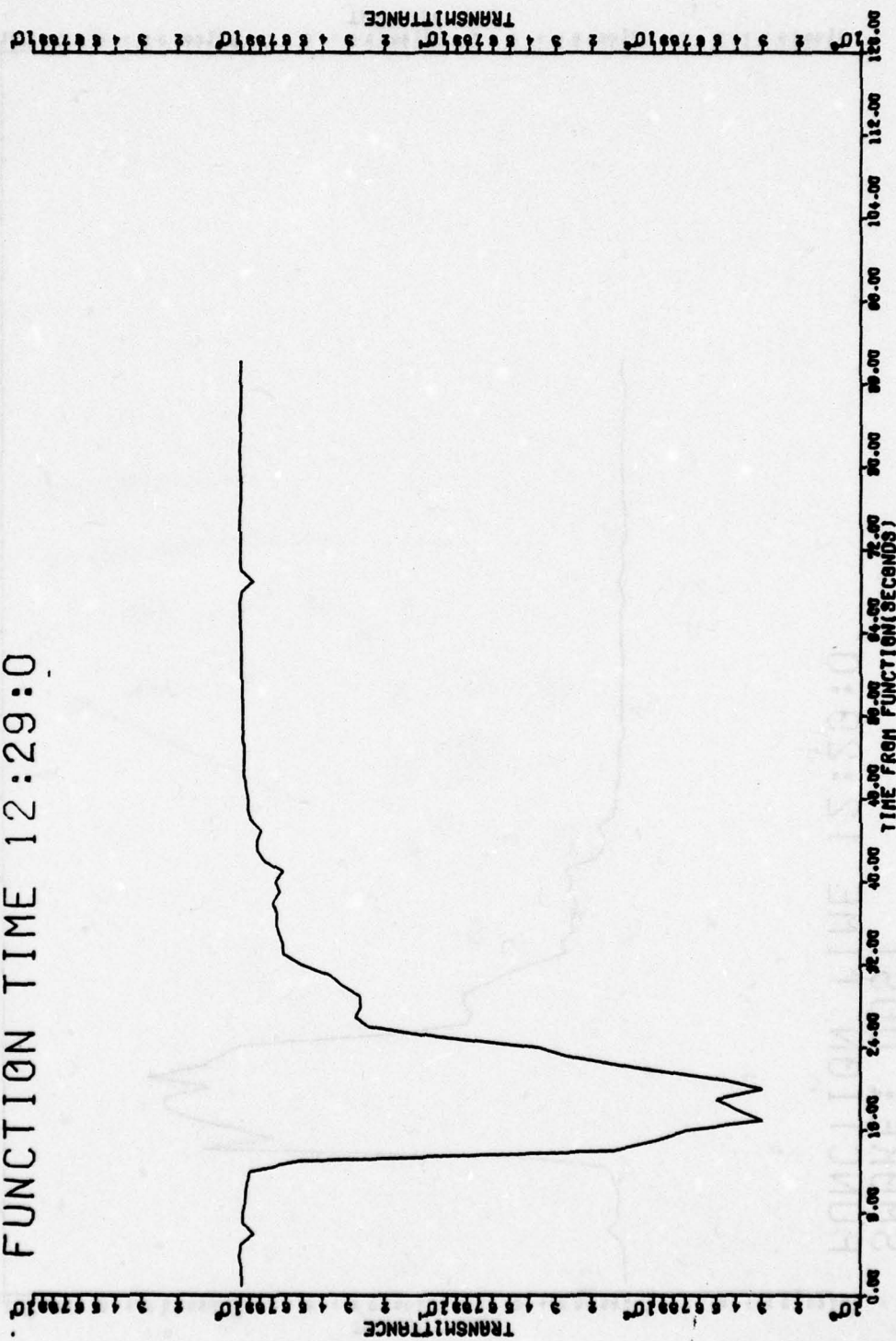
DATE: 16 May 1978

TIME: 1229

Wind Direction, degrees (2 meter) . . . . .	124
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.7
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	71°
Sky Conditions . . . . .	scattered
Type of Munitions . . . . .	M107, 155 mm
Number of Munitions . . . . .	3
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	088*
Range (meter) . . . . .	101
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.57
1.3 - 2.3 . . . . .	0.41
2.3 - 10.0 . . . . .	0.02
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
$\text{Log}_{10}$ NMD . . . . .	0.090
$\sigma \text{Log}_{10}$ NMD . . . . .	0.133
NMD ( $\mu\text{m}$ ) . . . . .	1.23

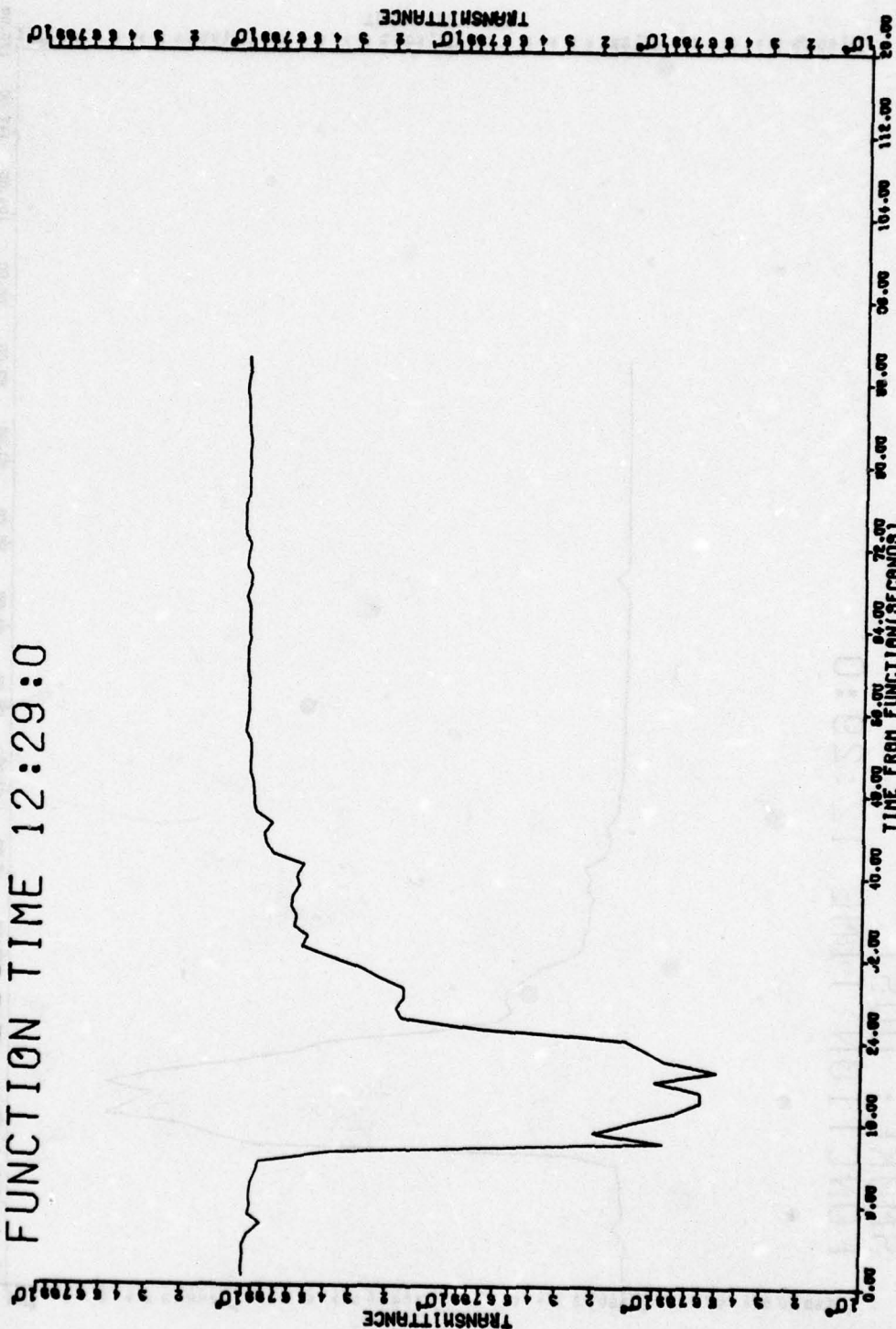
\*Average Azimuth and Range

TRIAL #8 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:29:0



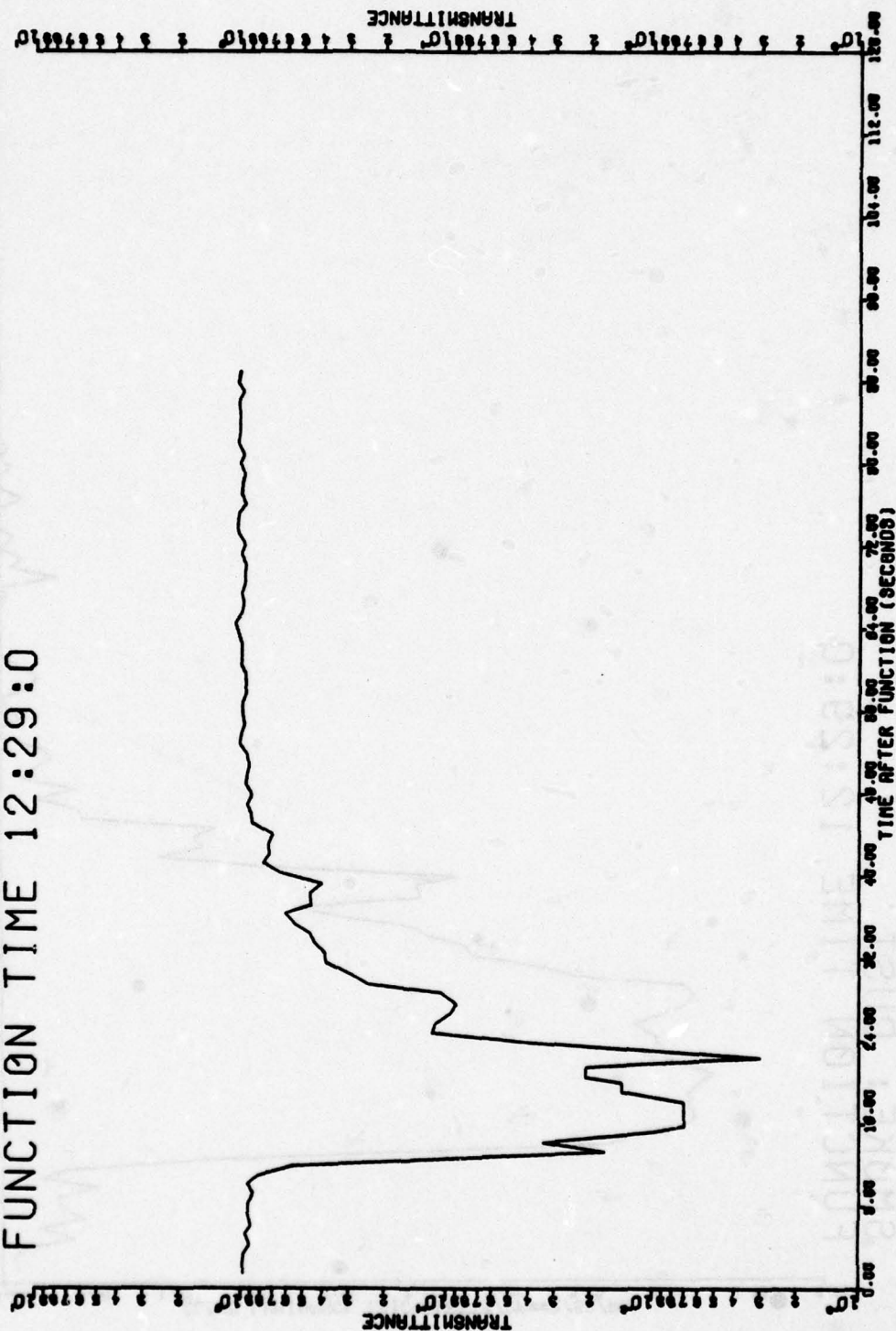
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #8 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:29:0



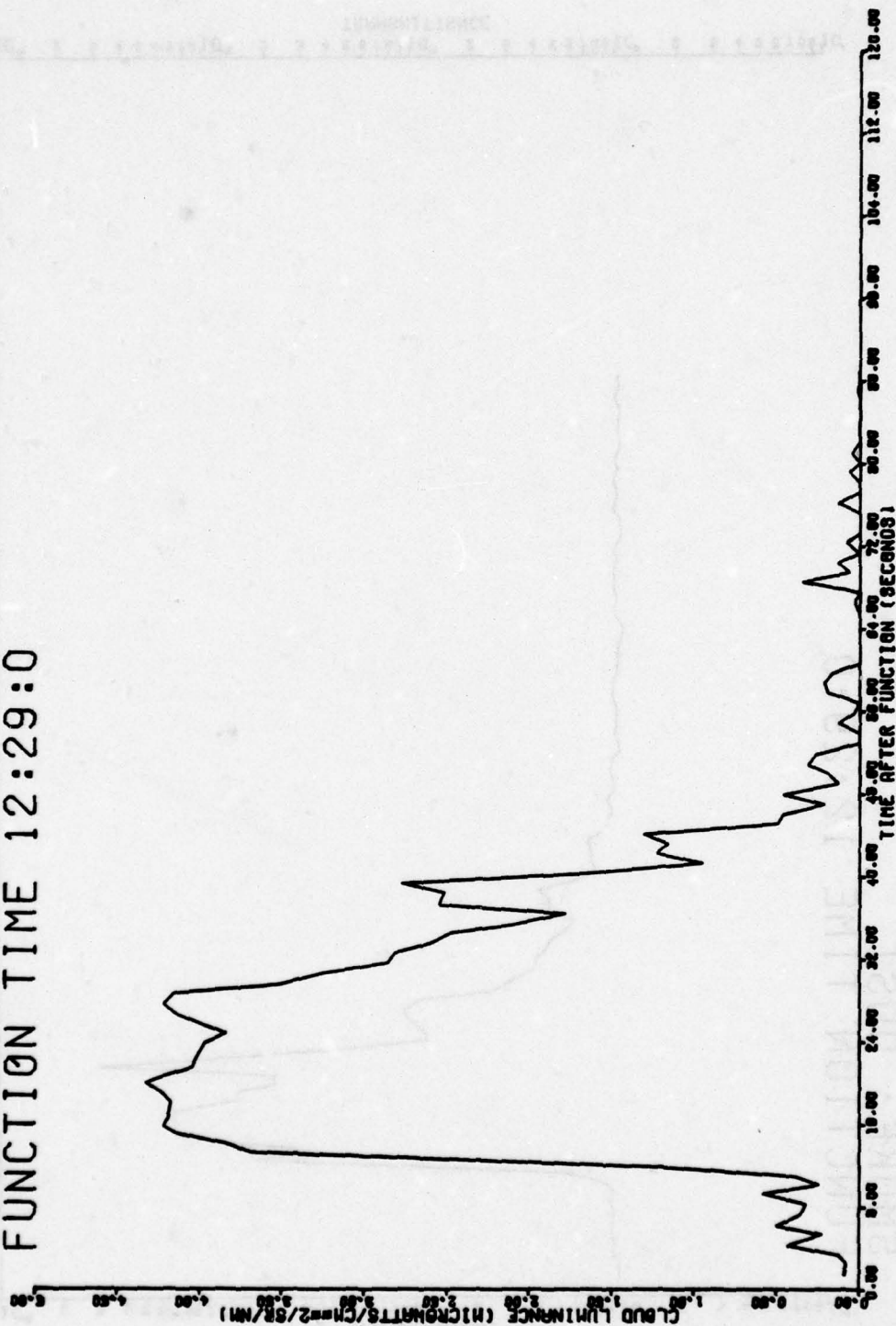
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #8 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:29:0



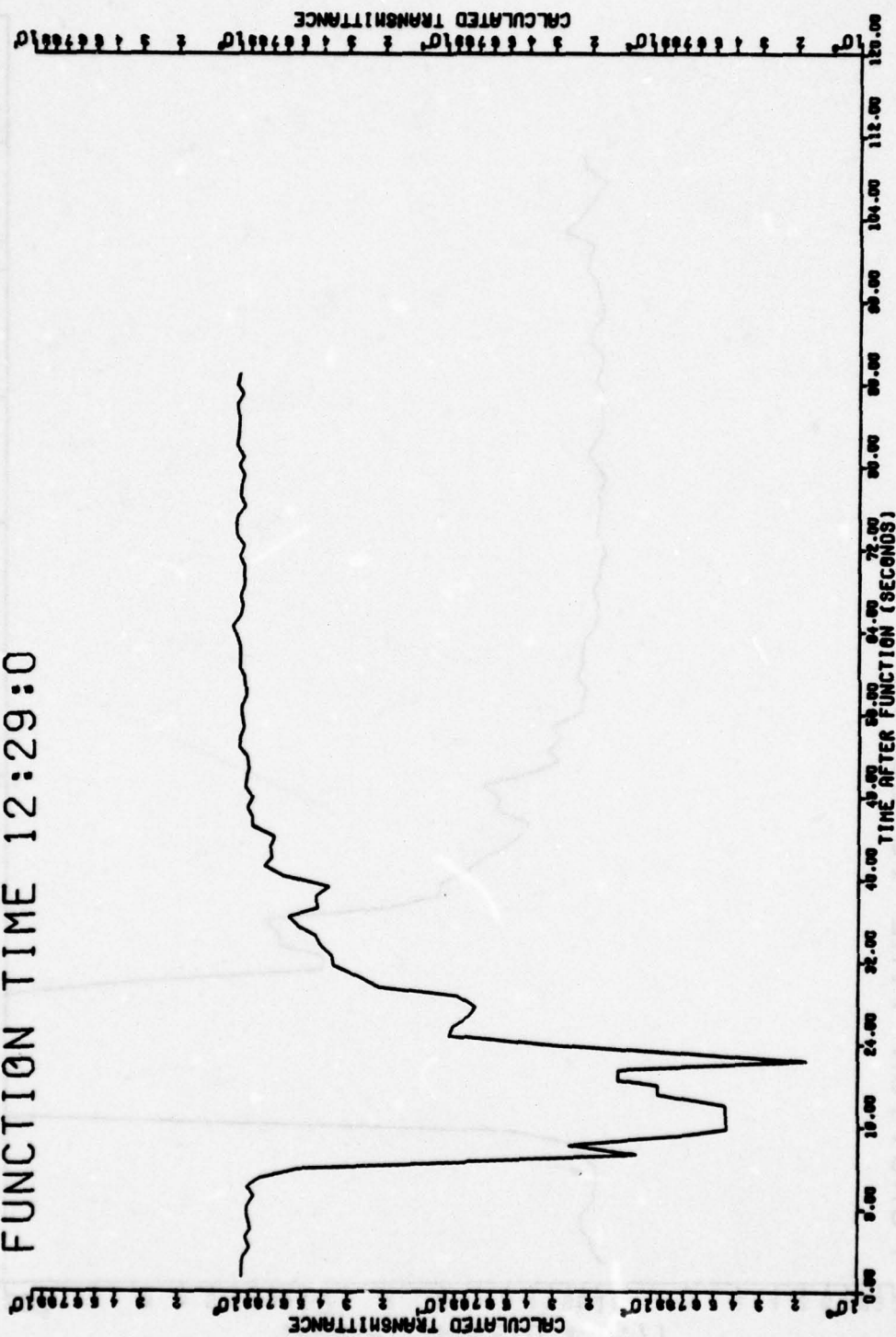
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #8 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:29:0



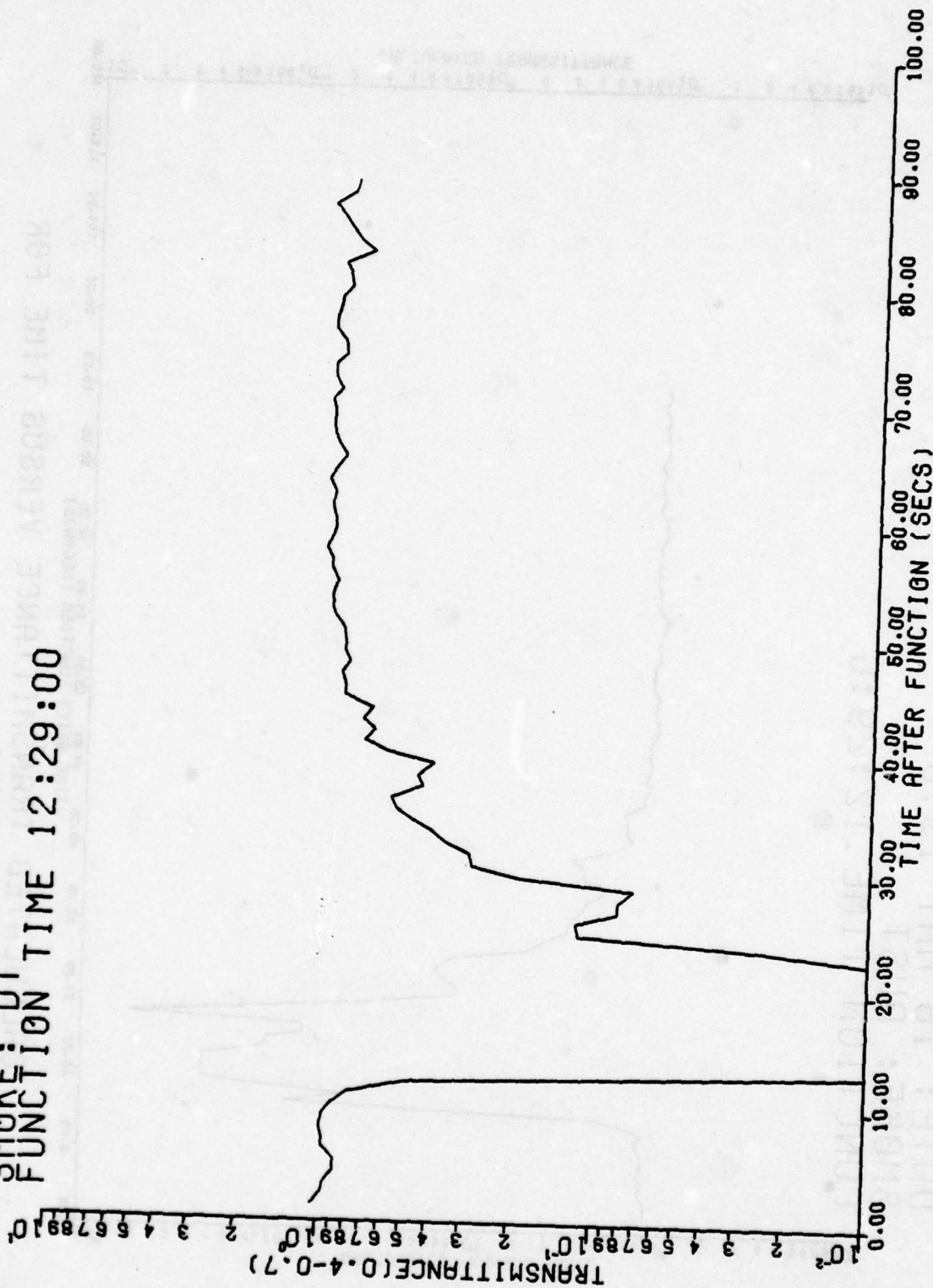
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #8 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:29:0



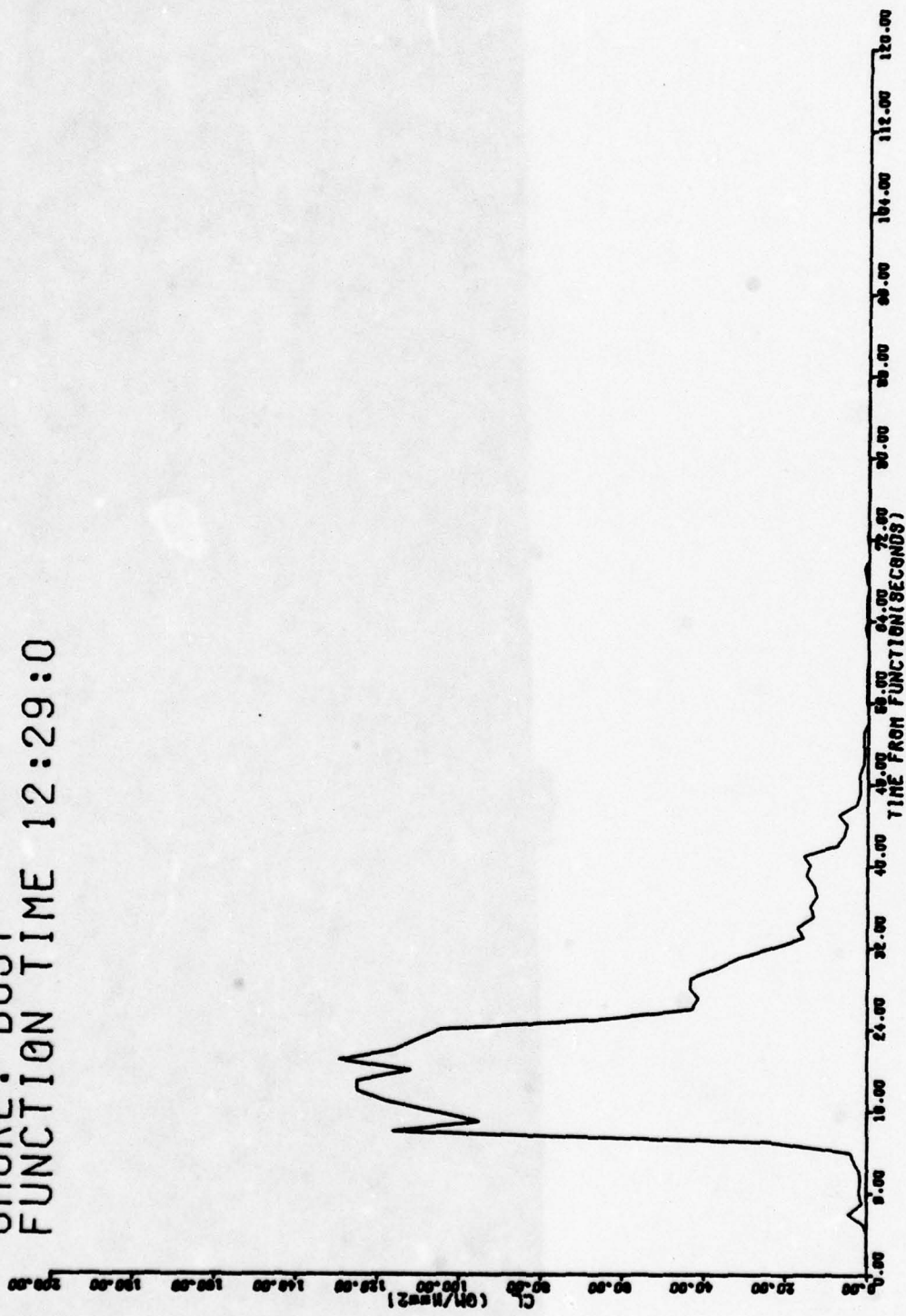
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 8: FT. SILL TESTS  
 DATE: 16 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 12:29:00

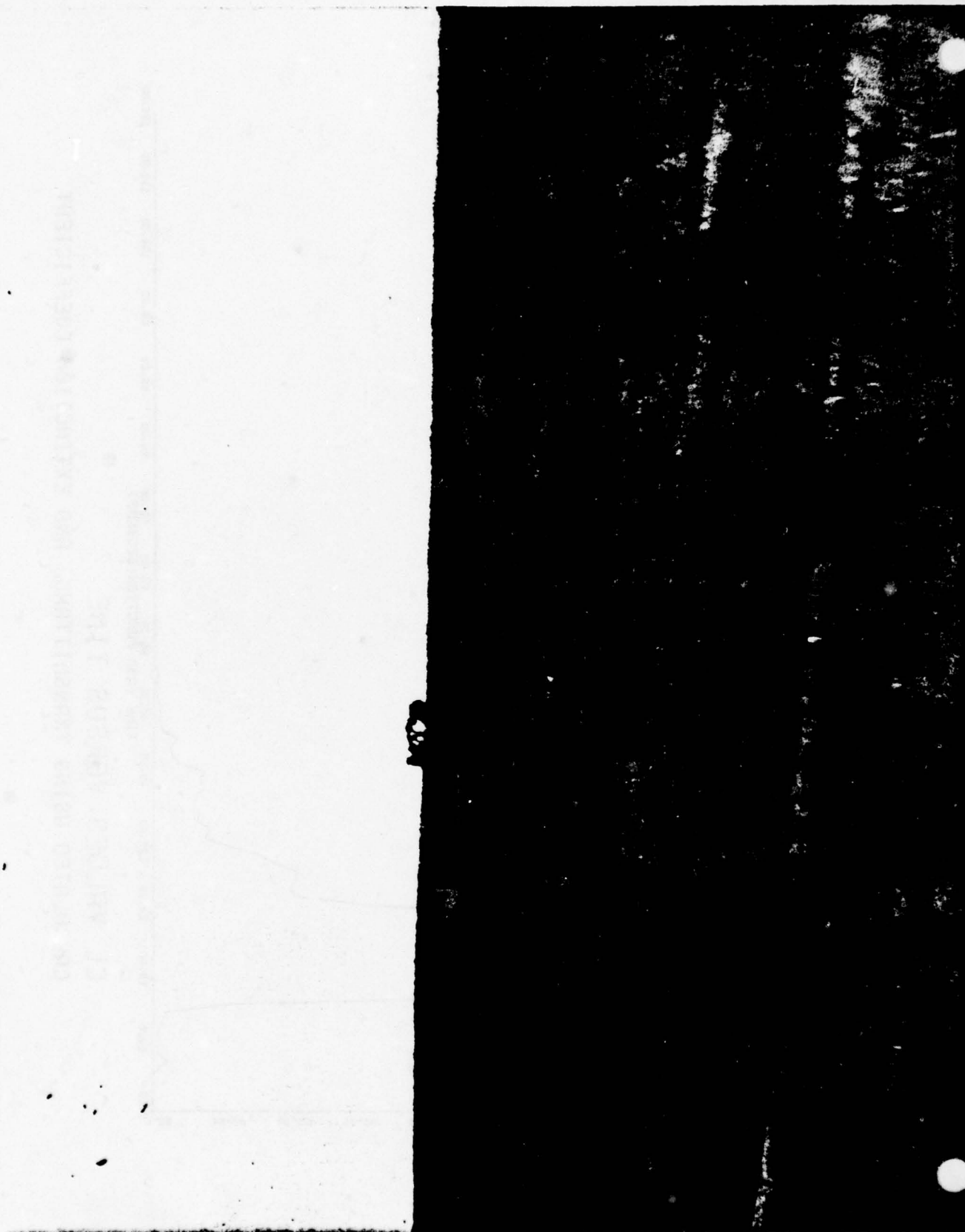


TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #8 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 12:29:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT



B-11-10

FIGURE: MUNITION DETONATION FOR TRIAL 8



B-11-11

FIGURE: DUST/DEBRIS CLOUD 10 SECONDS AFTER DETONATION

APPENDIX B, SECTION 12

CONTENTS

TRIAL DPI-005-T9 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-12-2	TABLE OF TEST DAY DATA
B-12-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-12-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-12-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-12-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-12-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-12-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-12-9	FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T9

DATE: 16 May 1978

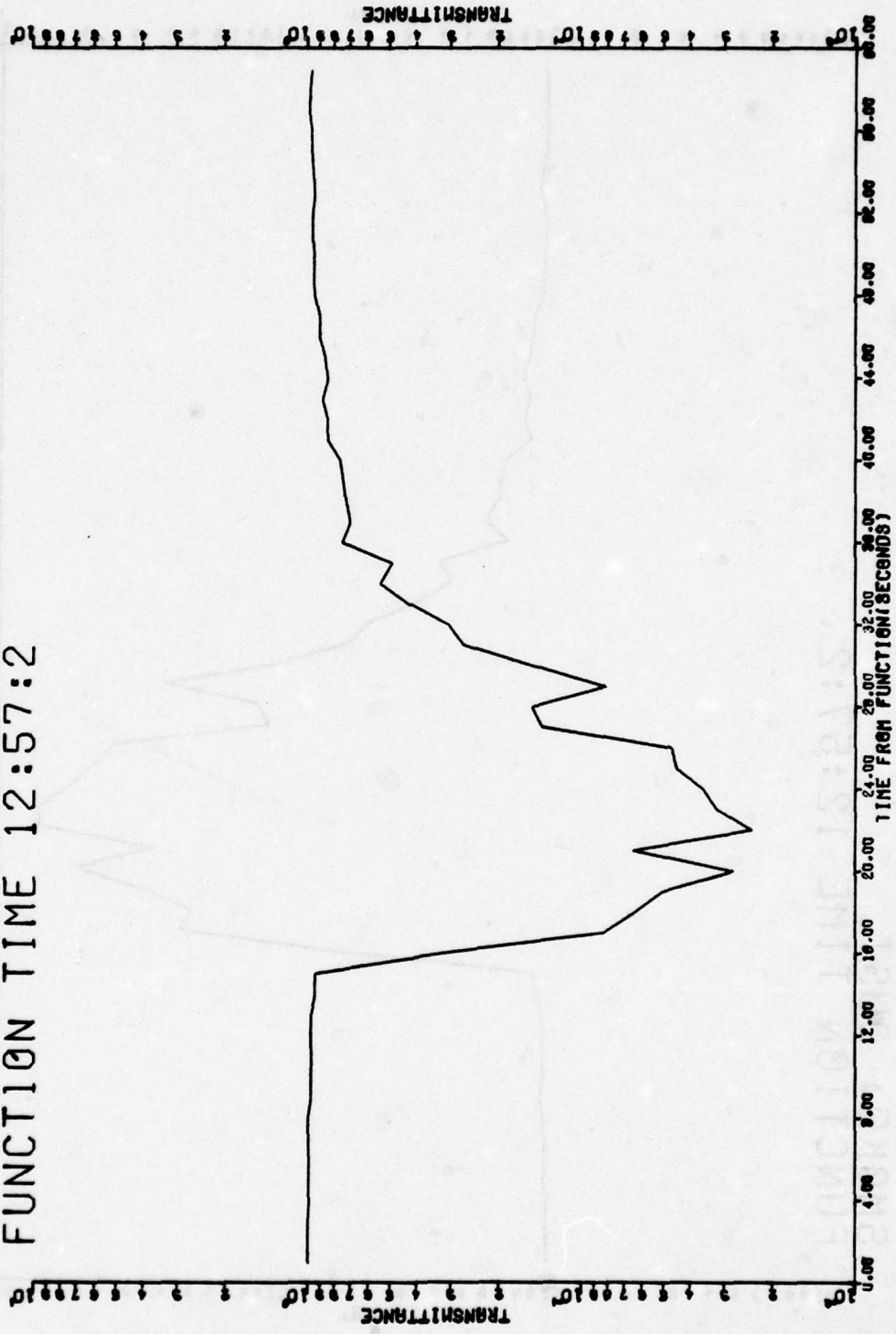
TIME: 1257

Wind Direction, degrees (2 meter) . . . . .	132
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	7.5
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	72°
Sky Conditions . . . . .	scattered
Type of Munitions . . . . .	M107, 155 mm
Number of Munitions . . . . .	2
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	090*
Range (meter) . . . . .	160

Particle size data are not available since the cloud did not encompass the PSA.

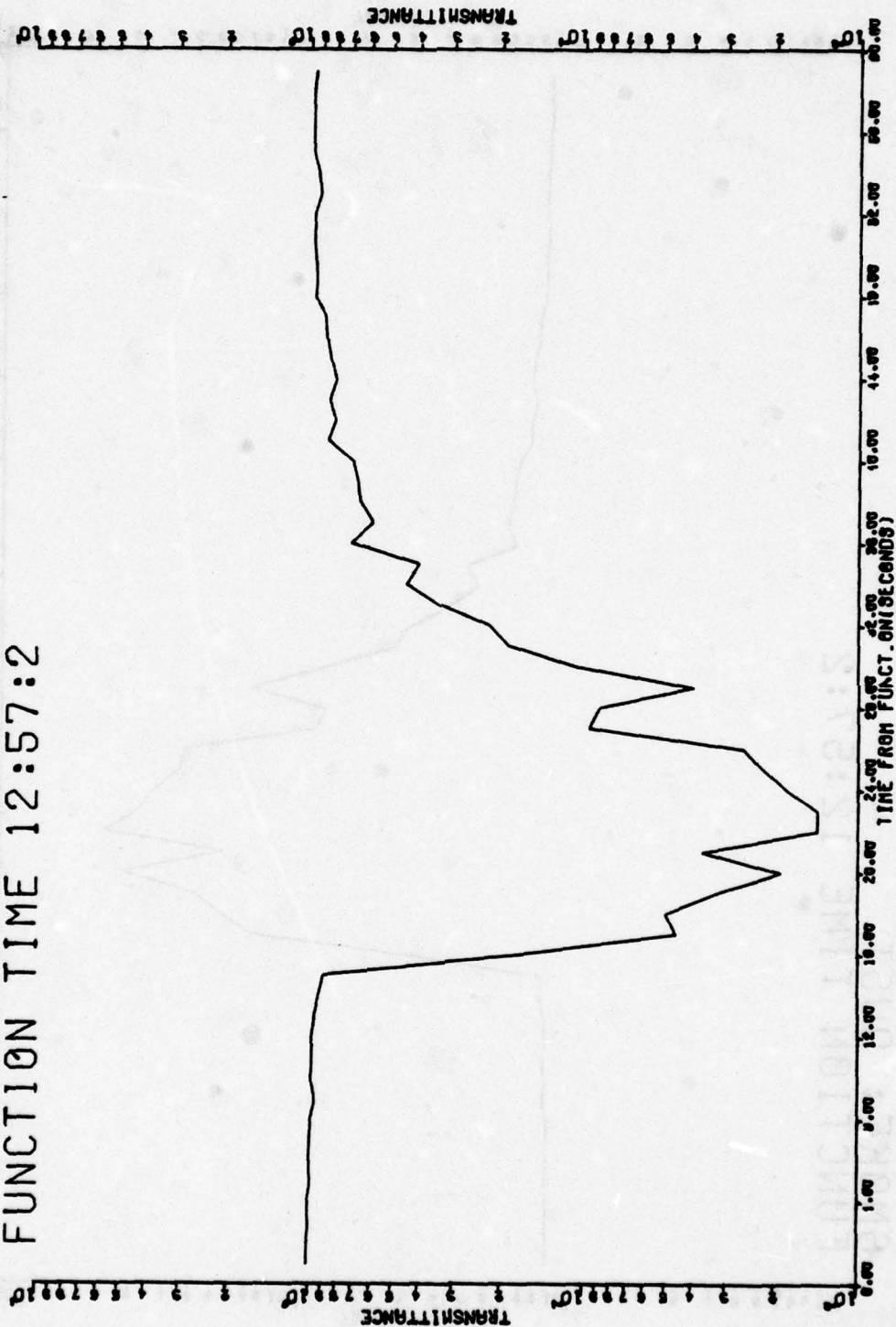
\*Average Azimuth and Range

TRIAL #9 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:57:2



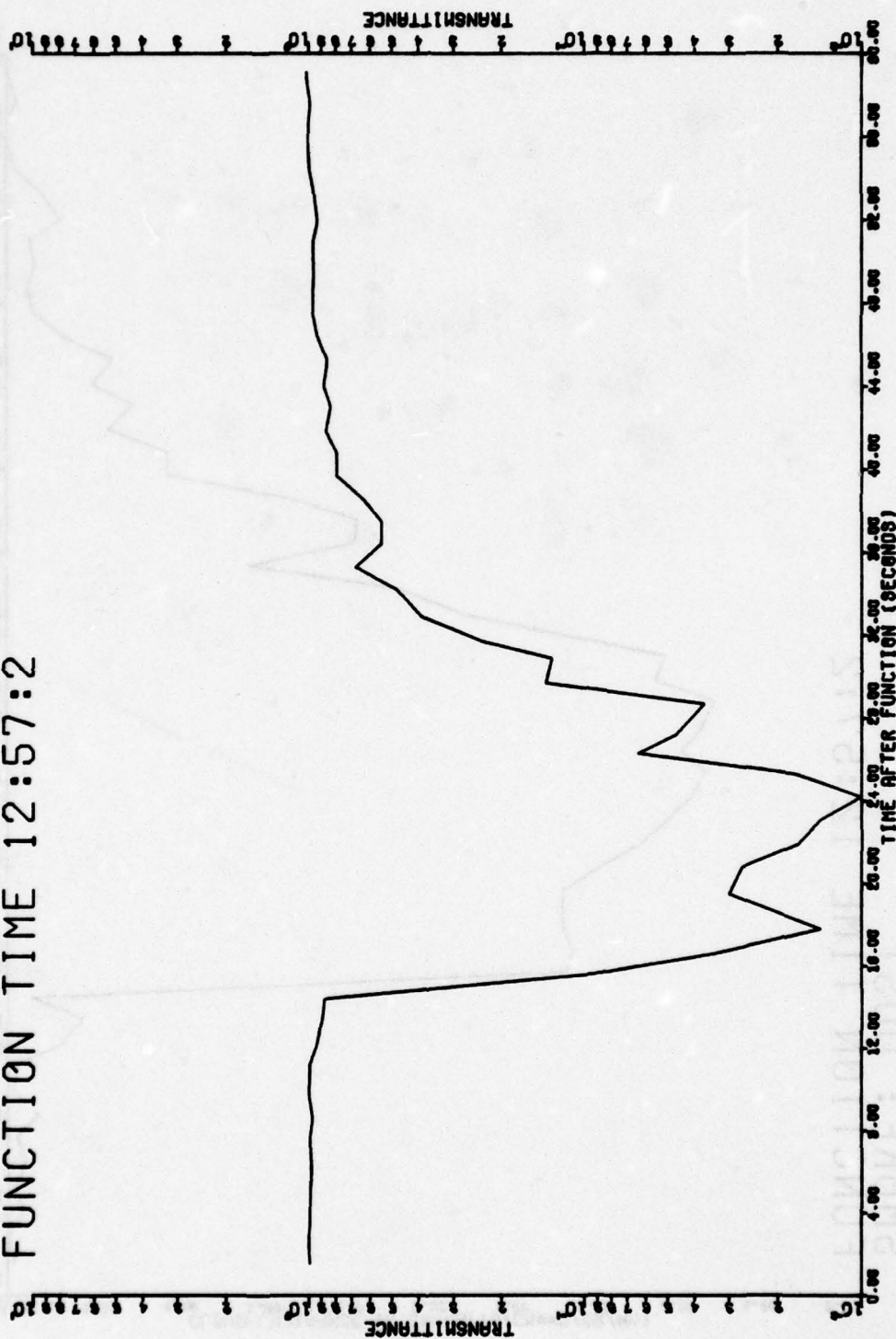
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 (μm)

TRIAL #9 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:57:2



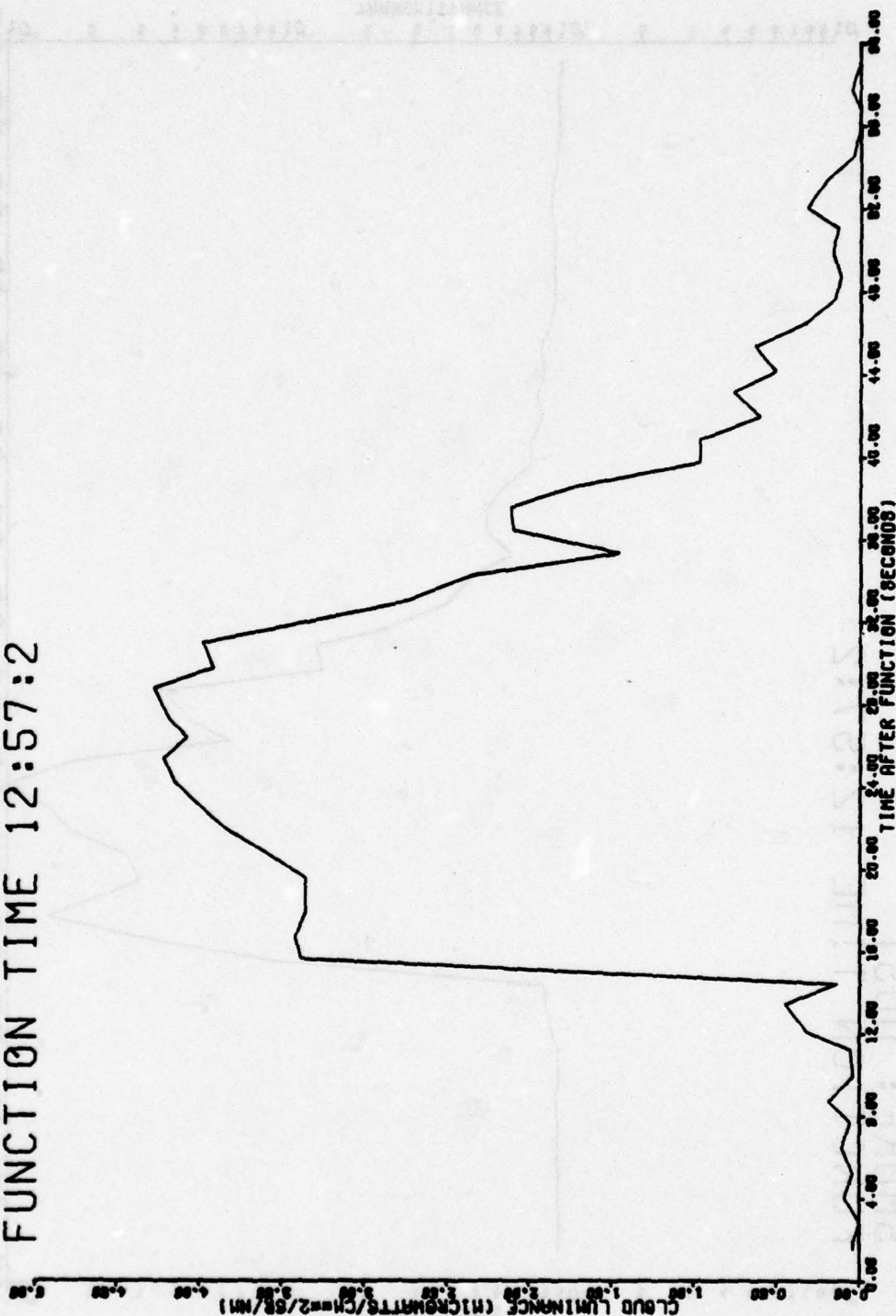
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #9 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:57:2



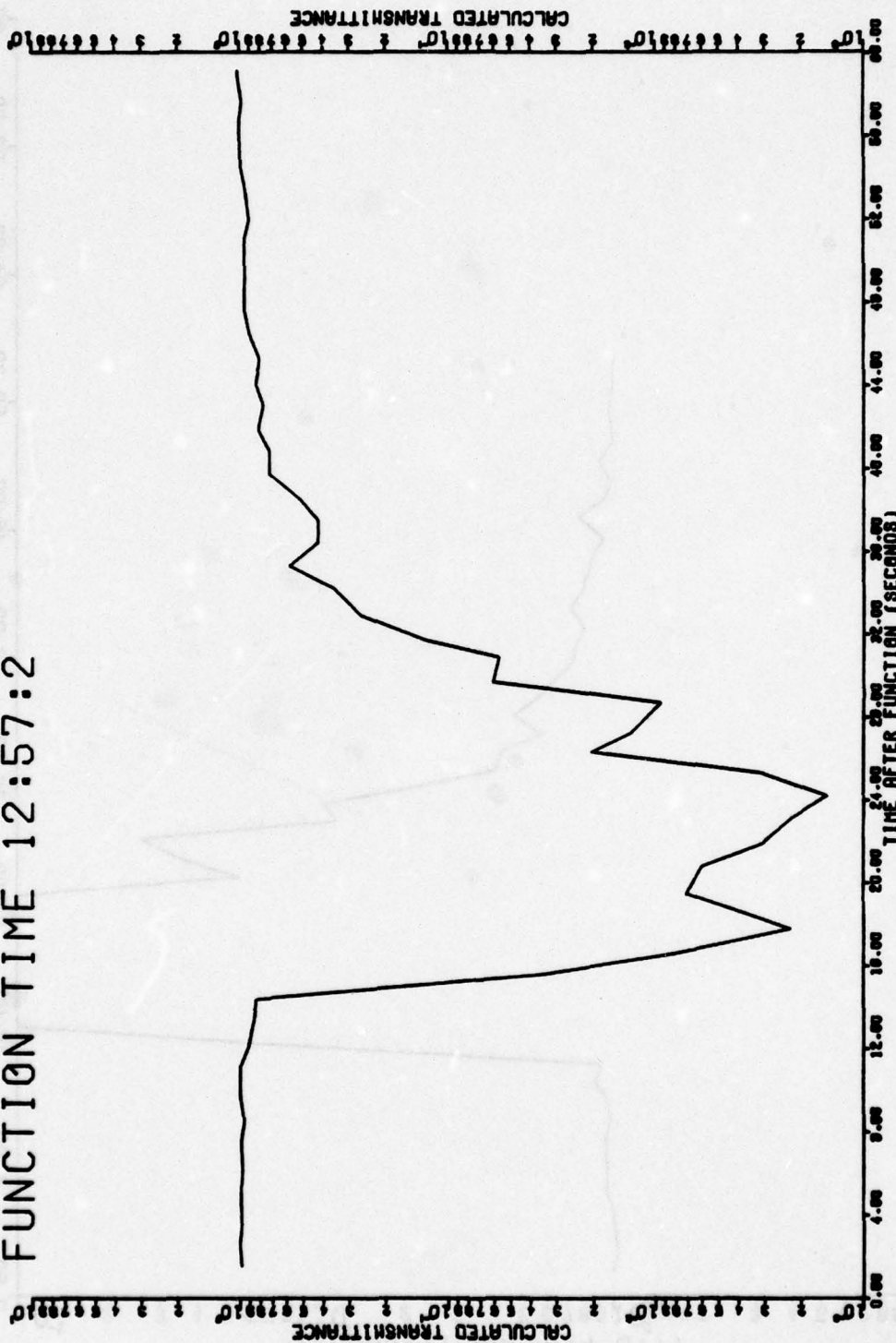
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #9 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:57:2



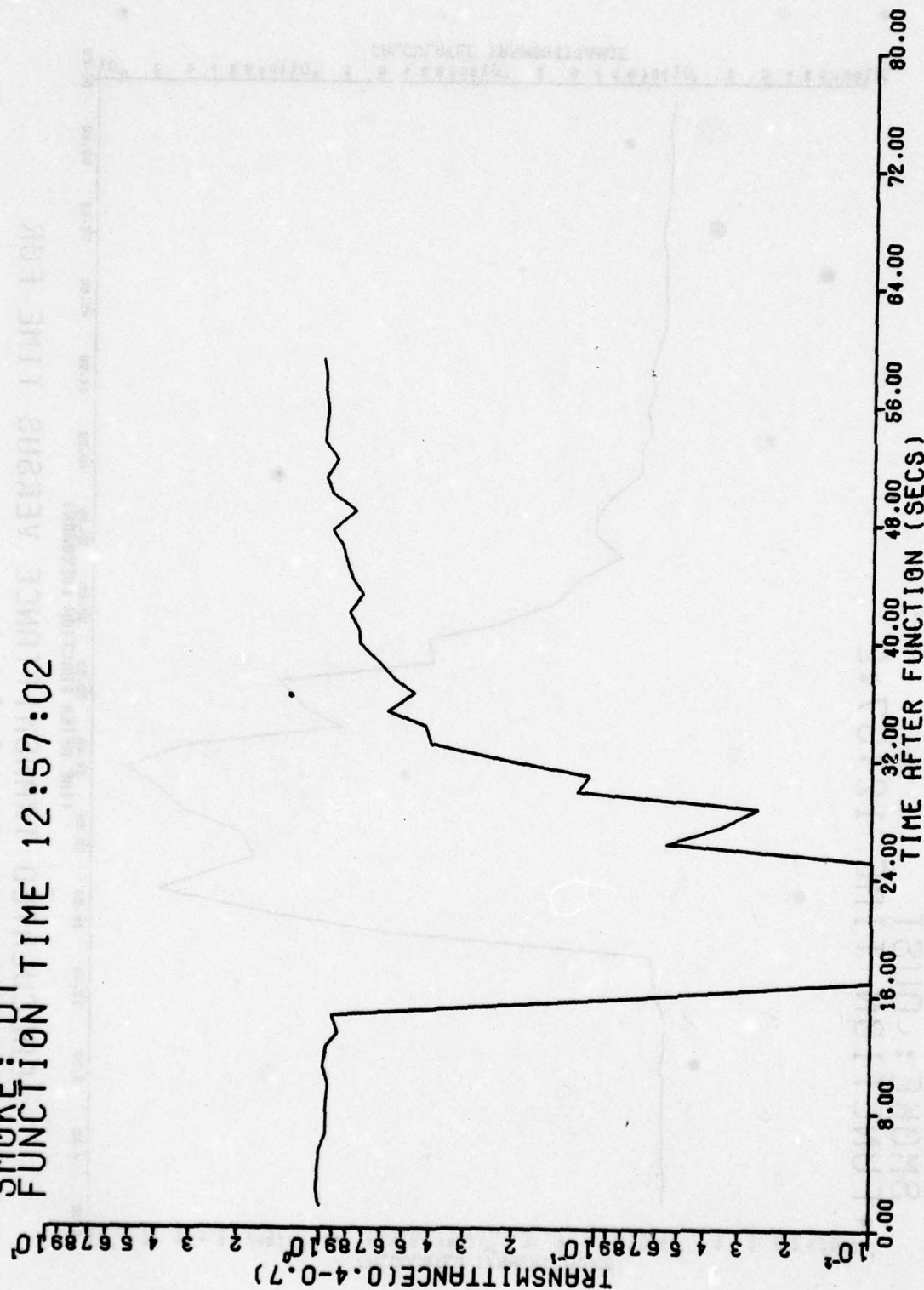
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #9 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:57:2



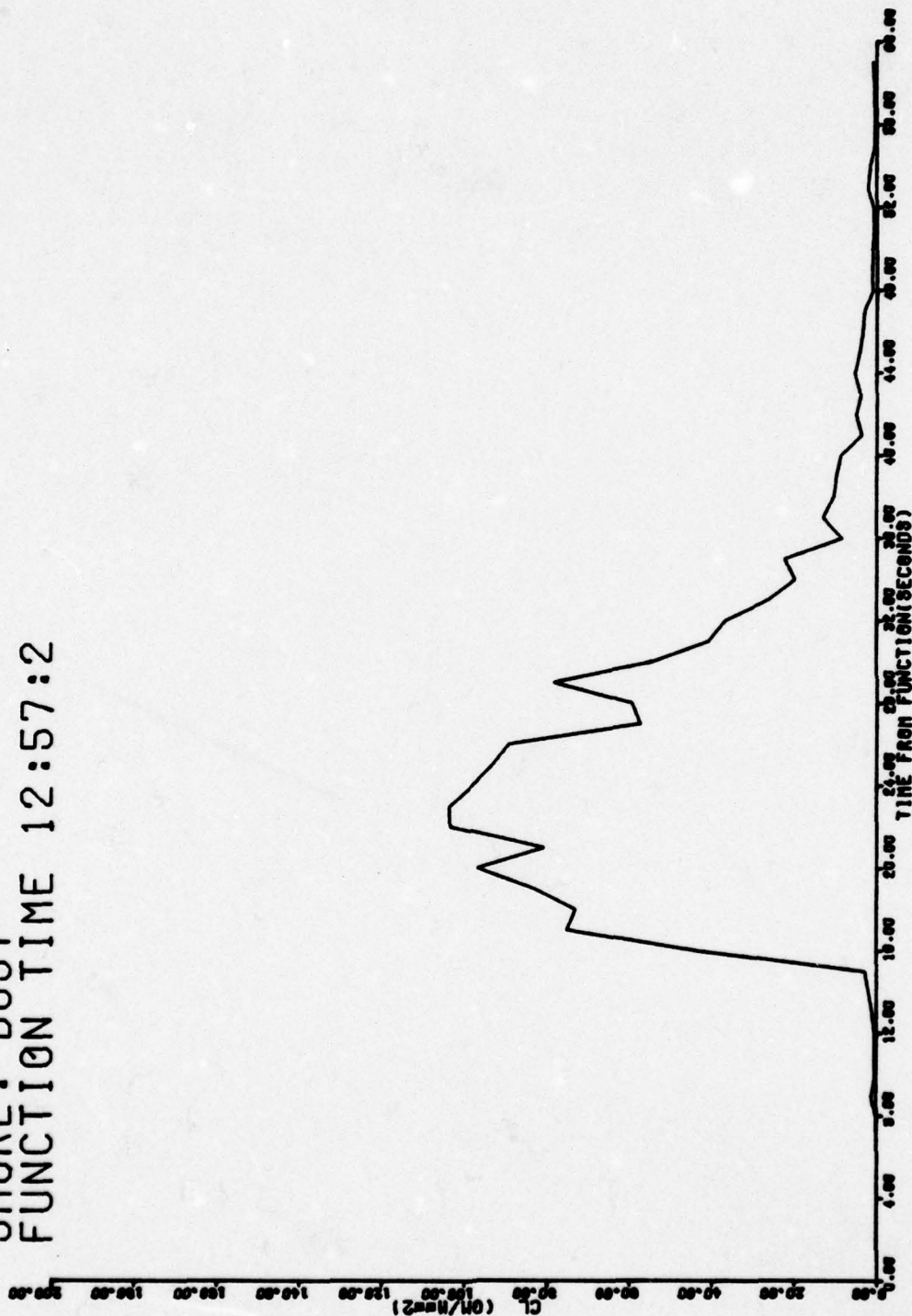
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 9: FT. SILL TESTS  
DATE: 16 MAY 1978  
SMOKE: DT  
FUNCTION TIME 12:57:02



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #9 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 12:57:2



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 13

CONTENTS

TRIAL DPI-005-T10 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-13-2	TABLE OF TEST DAY DATA
B-13-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-13-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-13-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-13-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-13-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-13-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-13-9	FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T10

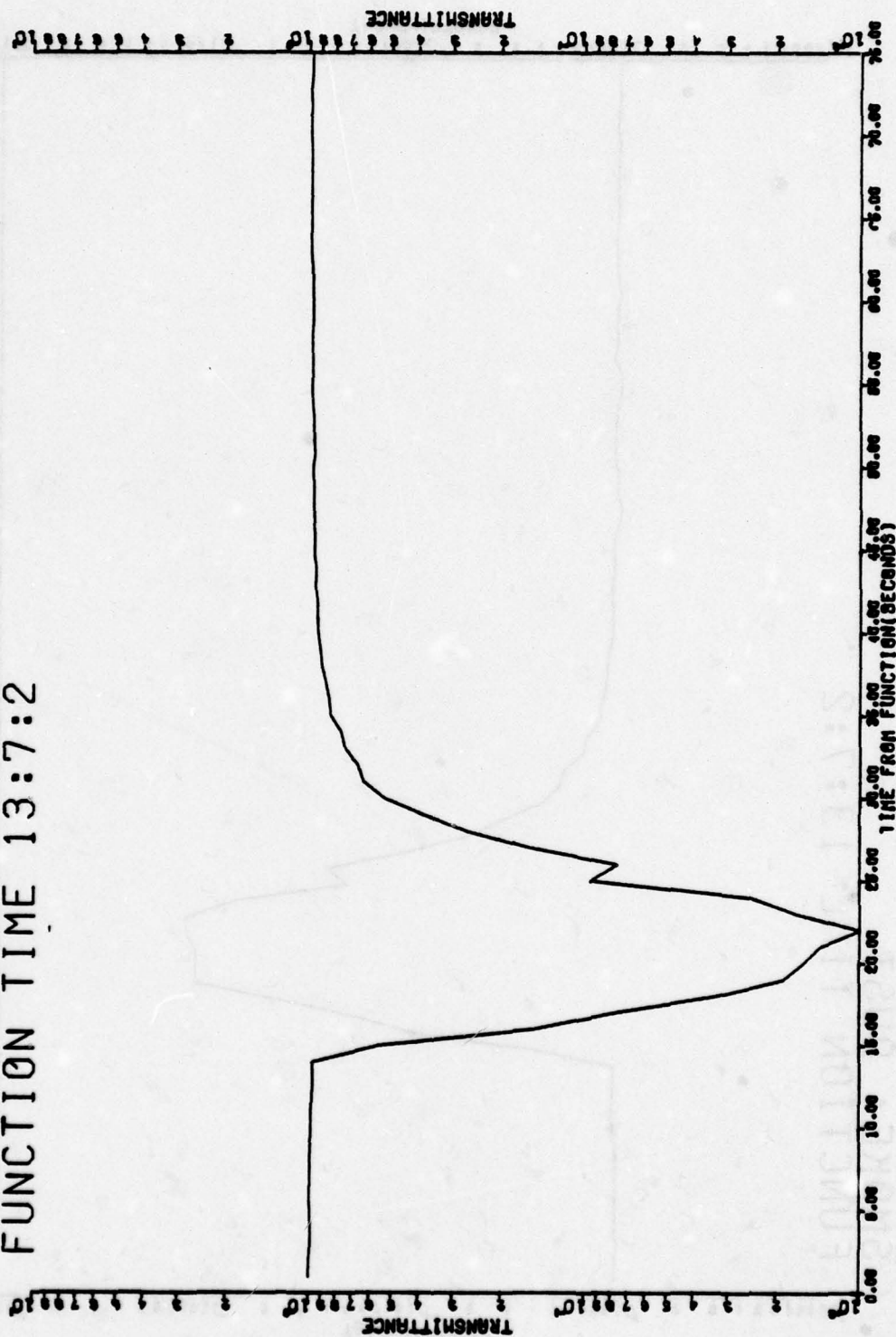
DATE: 16 May 1978

TIME: 1307

Wind Direction, degrees (2 meter) . . . . .	124
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	7.6
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	72°
Sky Conditions . . . . .	scattered
Type of Munition . . . . .	M107, 155 mm
Number of Munitions . . . . .	2
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	118*
Range (meter) . . . . .	153
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.51
1.3 - 2.3 . . . . .	0.39
2.3 - 10.0 . . . . .	0.12
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	1.17**

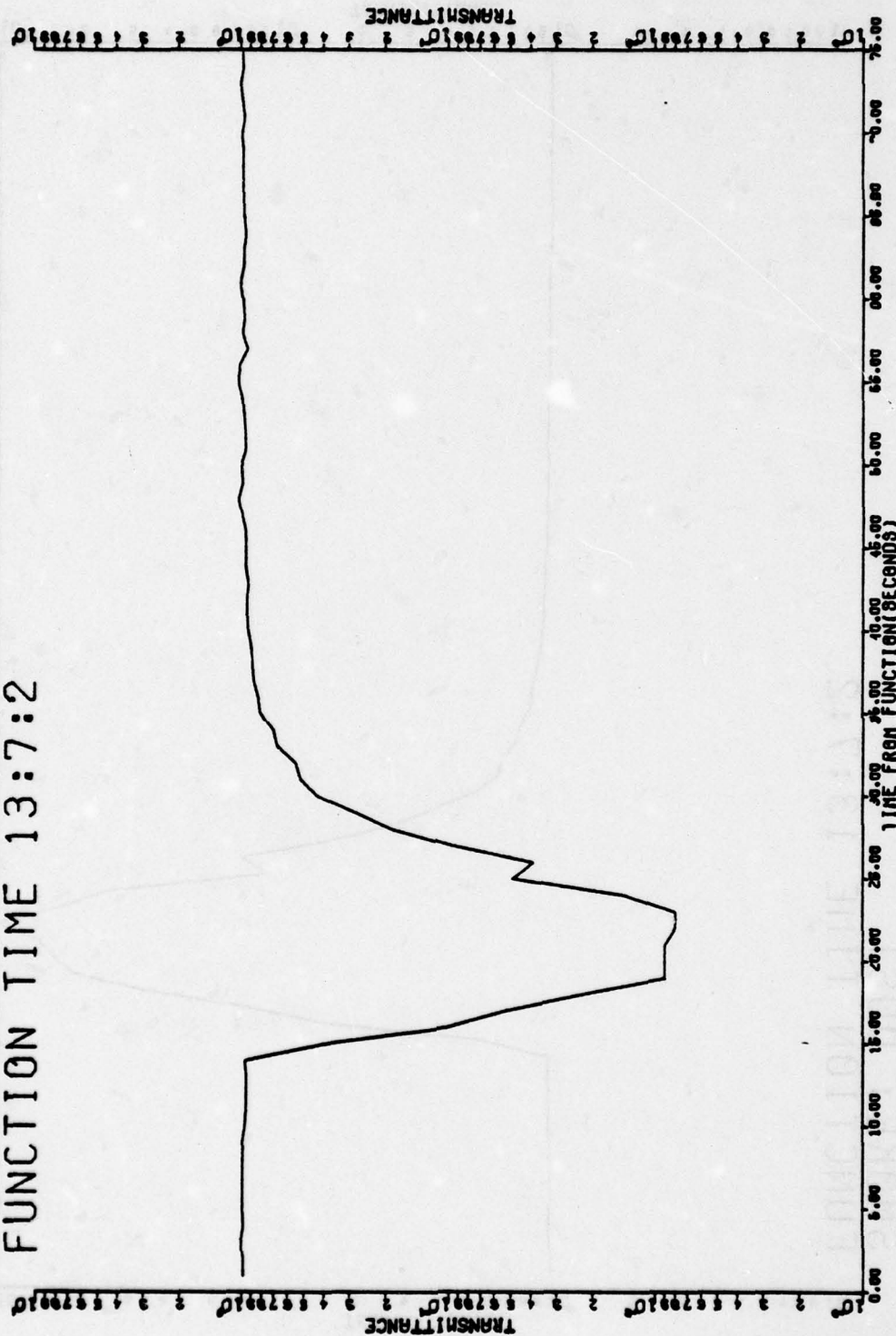
\*Average Azimuth and Range  
 \*\*Graphical estimate provided

TRIAL #10 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:7:2



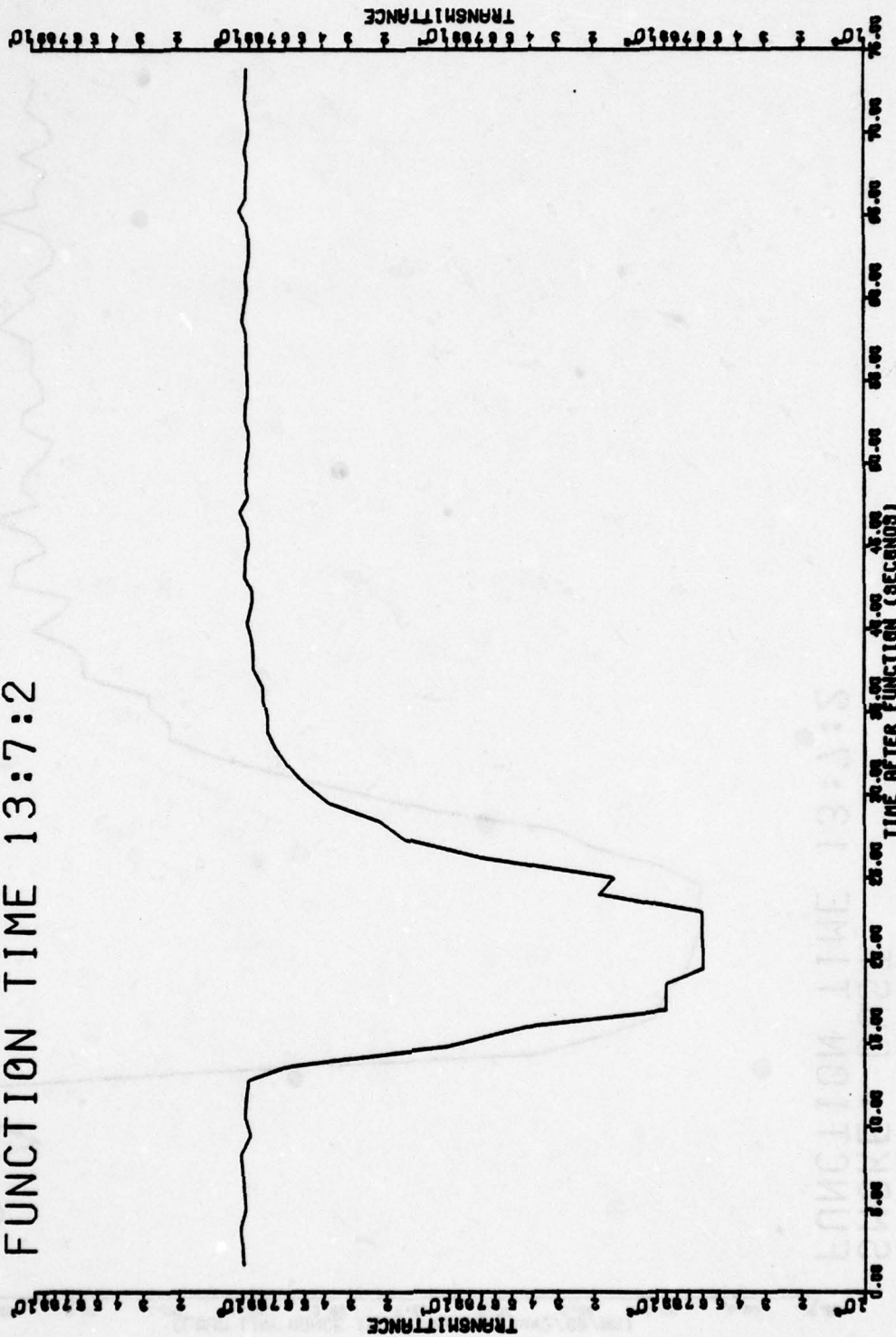
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #10 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:7:2



TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #10 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:7:2

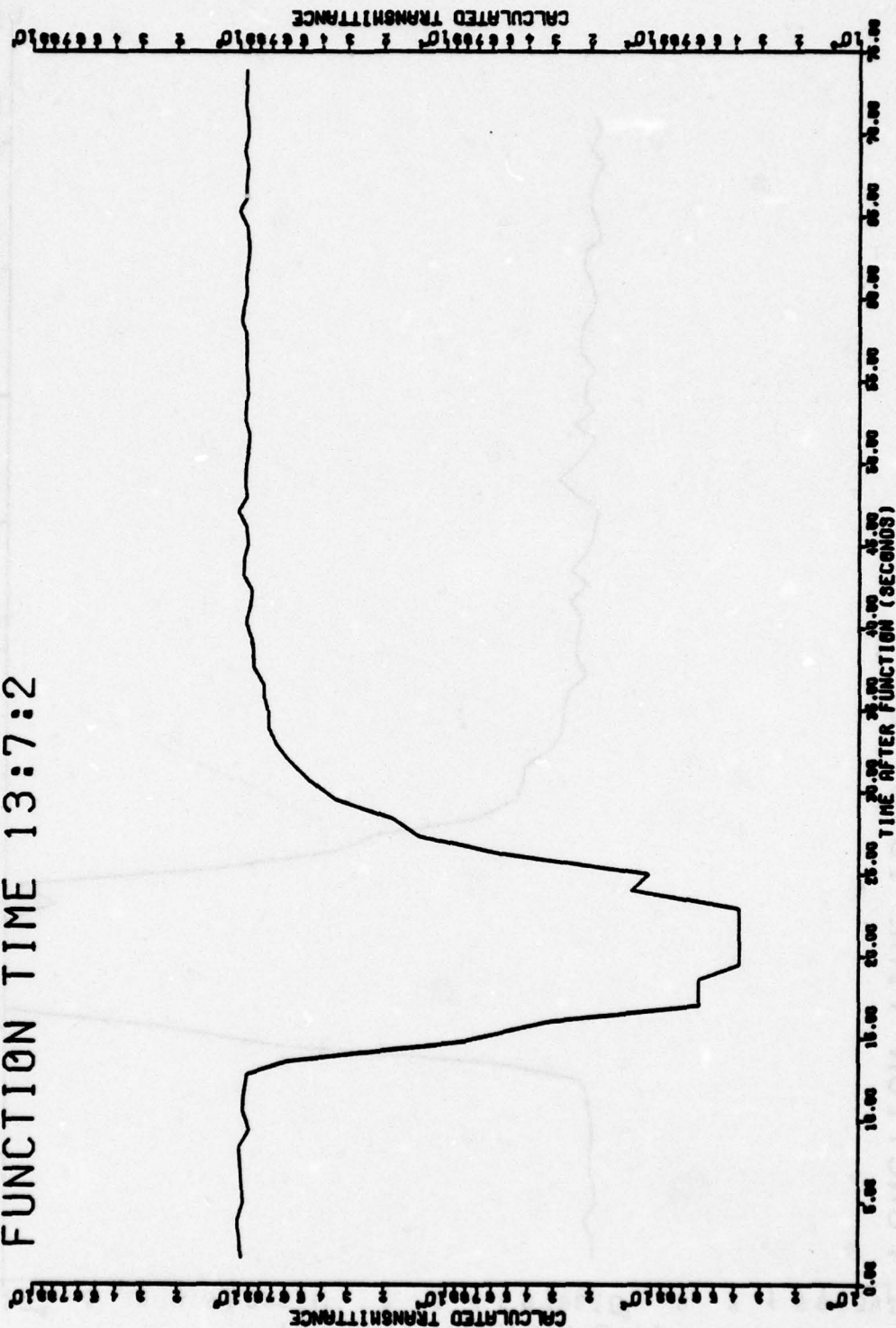


TRIAL #10 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:7:2



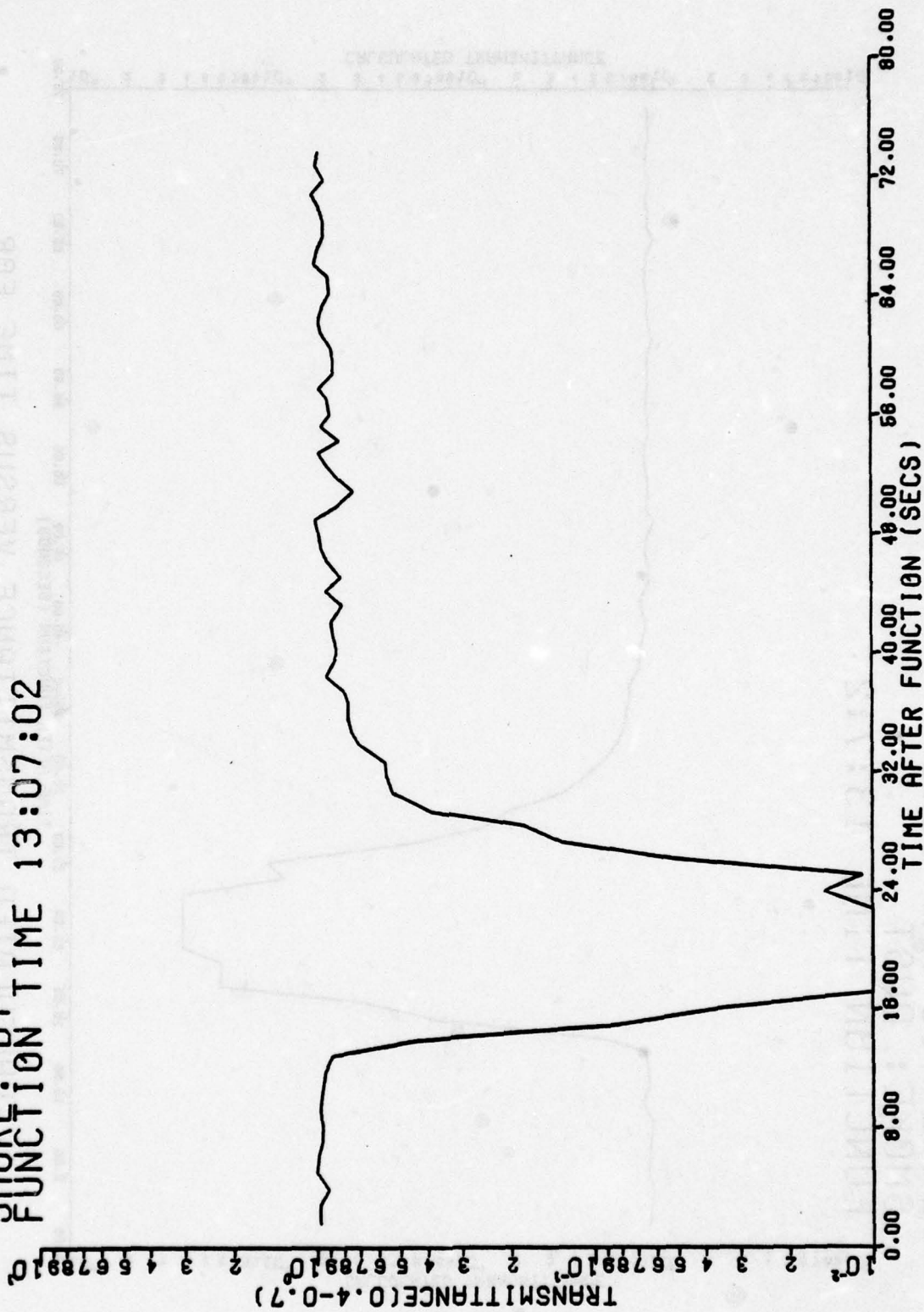
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #10 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:7:2



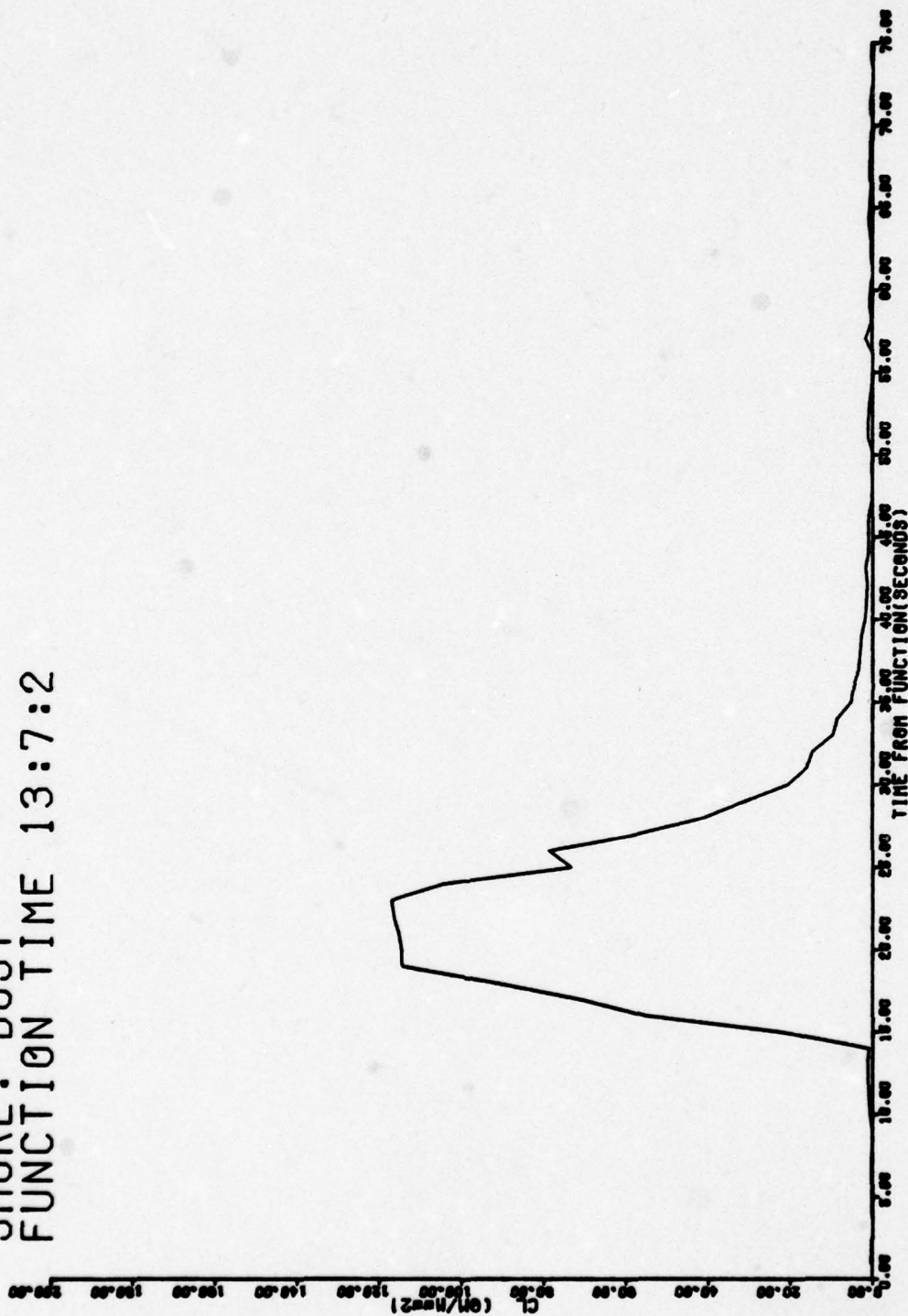
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 10: FT. SILL TESTS  
DATE: 16 MAY 1978  
SMOKE: DT  
FUNCTION TIME 13:07:02



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #10 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 13:7:2



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 14

CONTENTS

TRIAL DPI-005-T11 (DUST) 16 MAY 1978

<u>PAGE</u>	
B-14-2	TABLE OF TEST DAY DATA
B-14-3	FIGURE: DOSAGE BY SAMPLING POSITION
B-14-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-14-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-14-6	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-14-7	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-14-8	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-14-9	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-14-10	FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T11

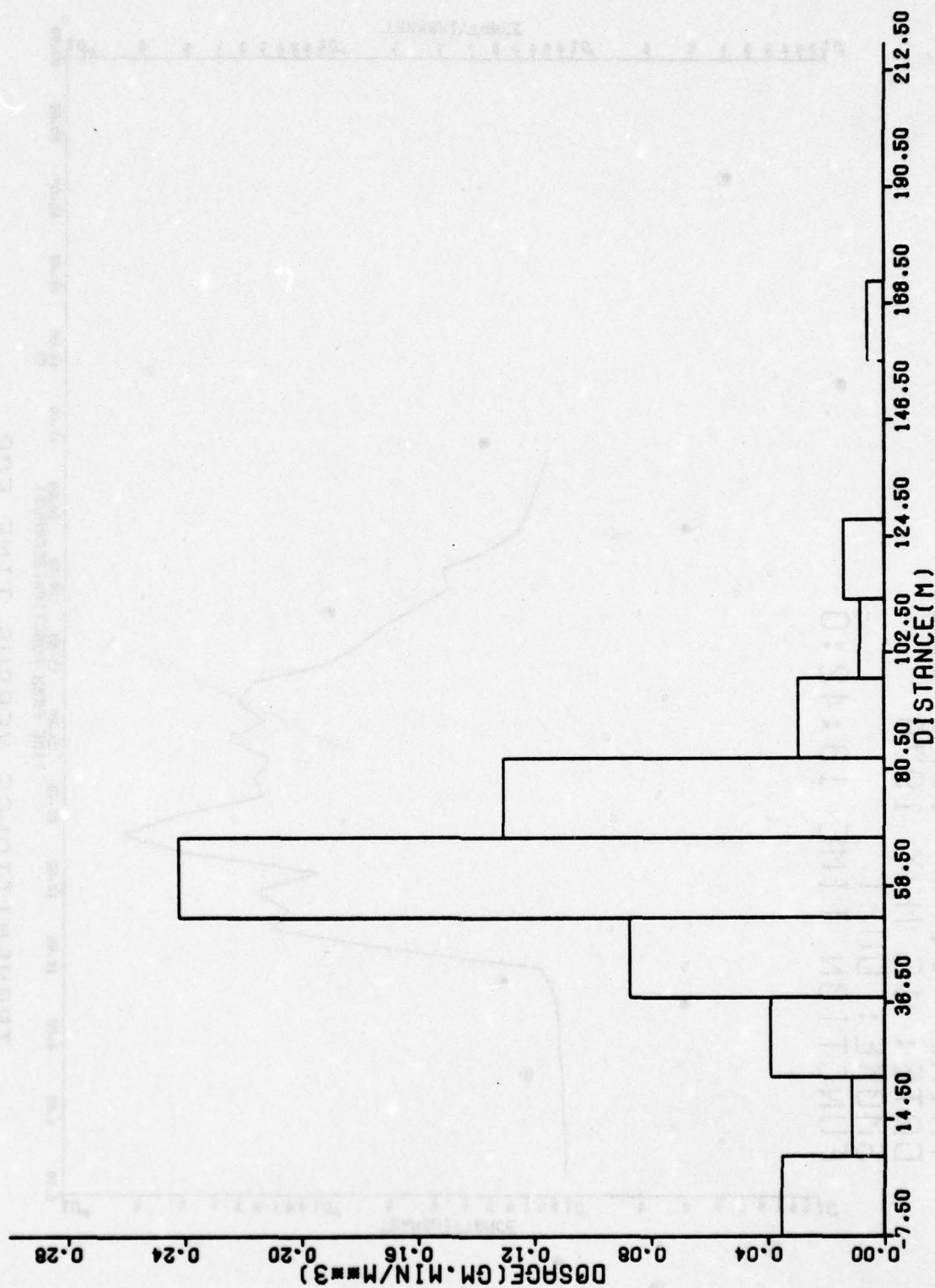
DATE: 16 May 1978

TIME: 1342

Wind Direction, degrees (2 meter) . . . . .	115
Wind Speed, U, meters/second (2 meter) . . . . .	7.3
Relative Humidity, percent (2 meter) . . . . .	64
Temperature . . . . .	72°
Sky Conditions . . . . .	scattered
Type of Munition . . . . .	M107, 155 mm
Number of Munitions . . . . .	2
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	109*
Range (meter) . . . . .	111

Particle size data are not available since the cloud did not encompass the PSA.

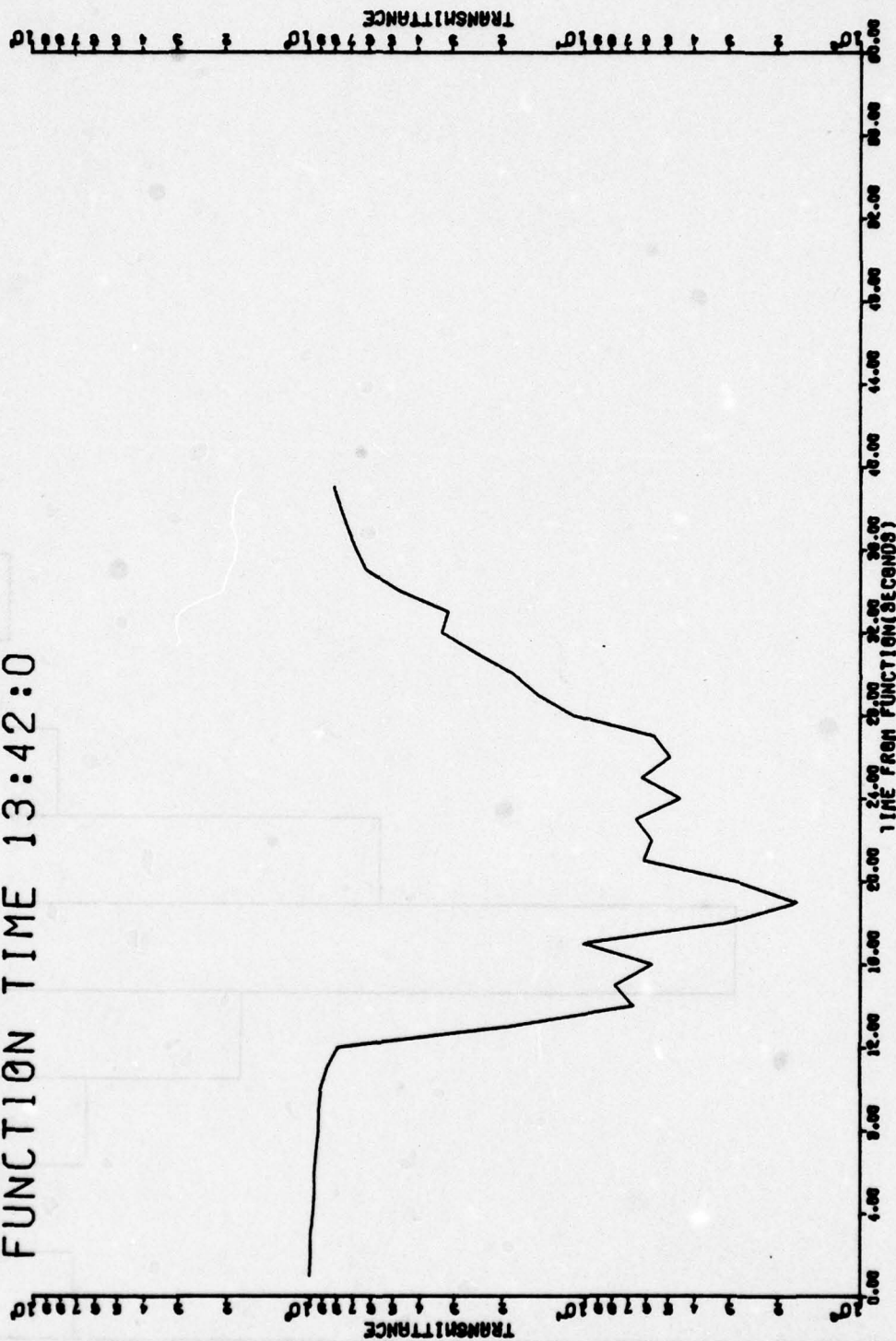
\*Average Azimuth and Range



B-14-3 .

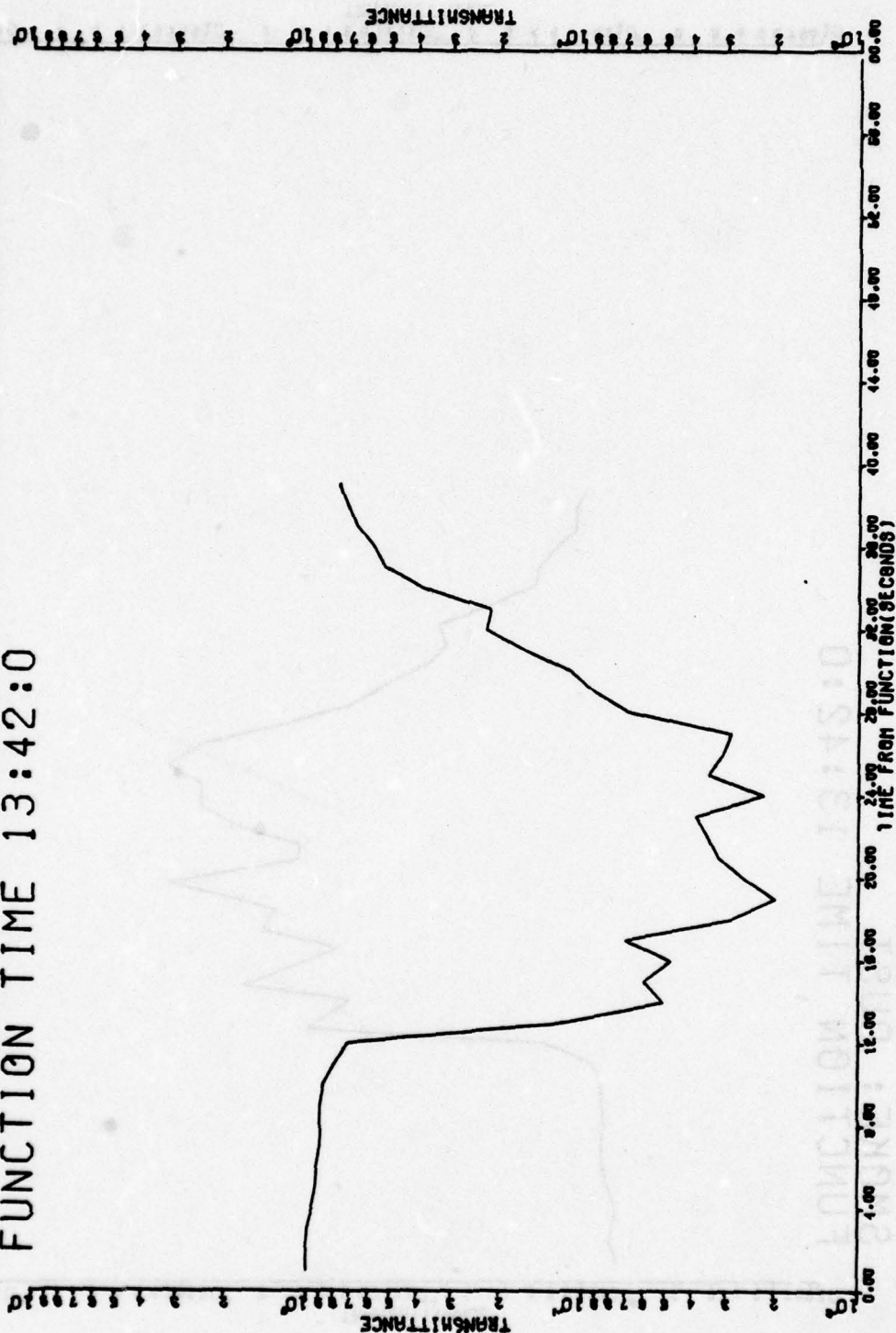
TRIAL 11, FT. SILL TESTS, 16 MAY 78, 13:42:00, DUST

TRIAL #11 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:42:0



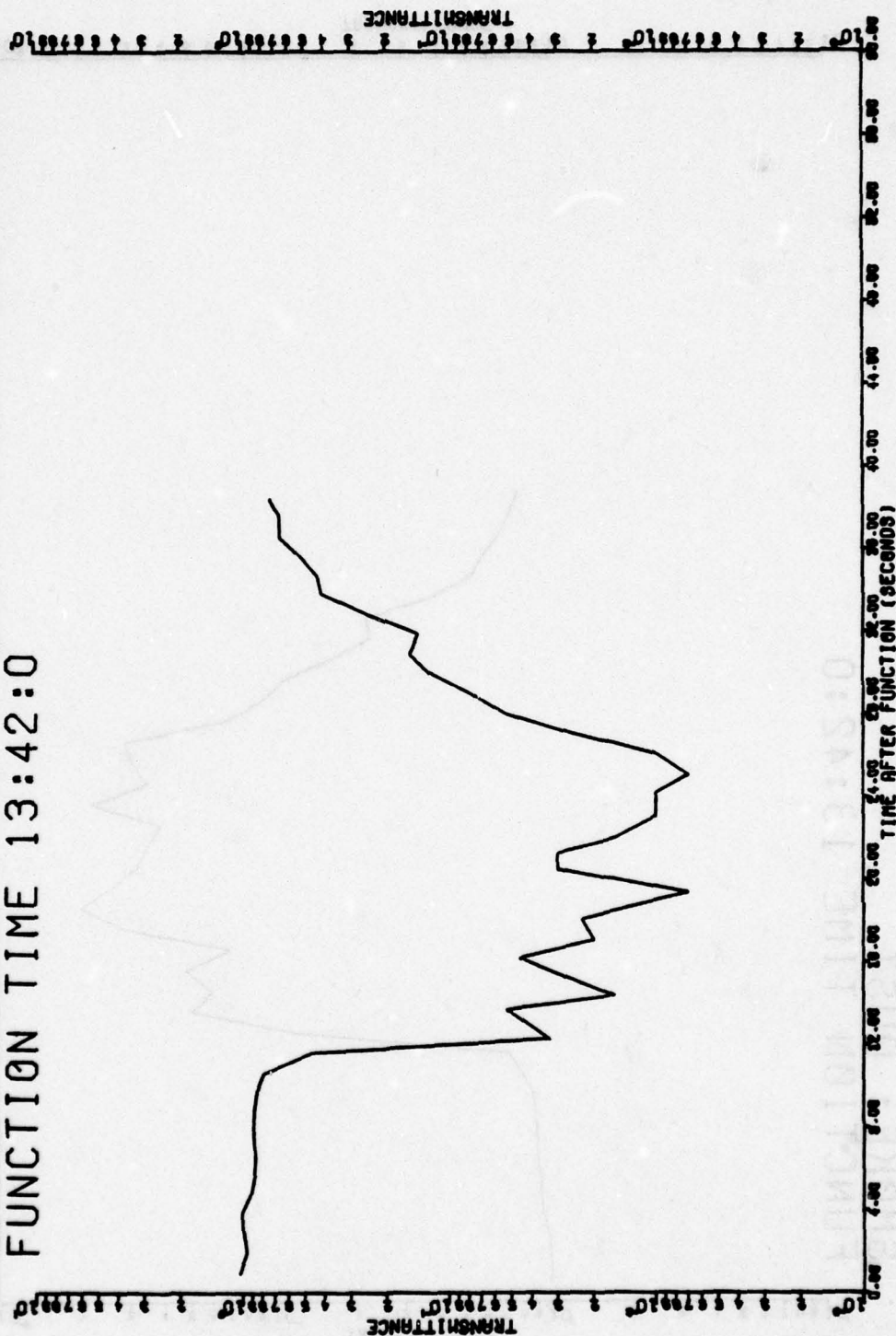
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #11 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 13:42:0



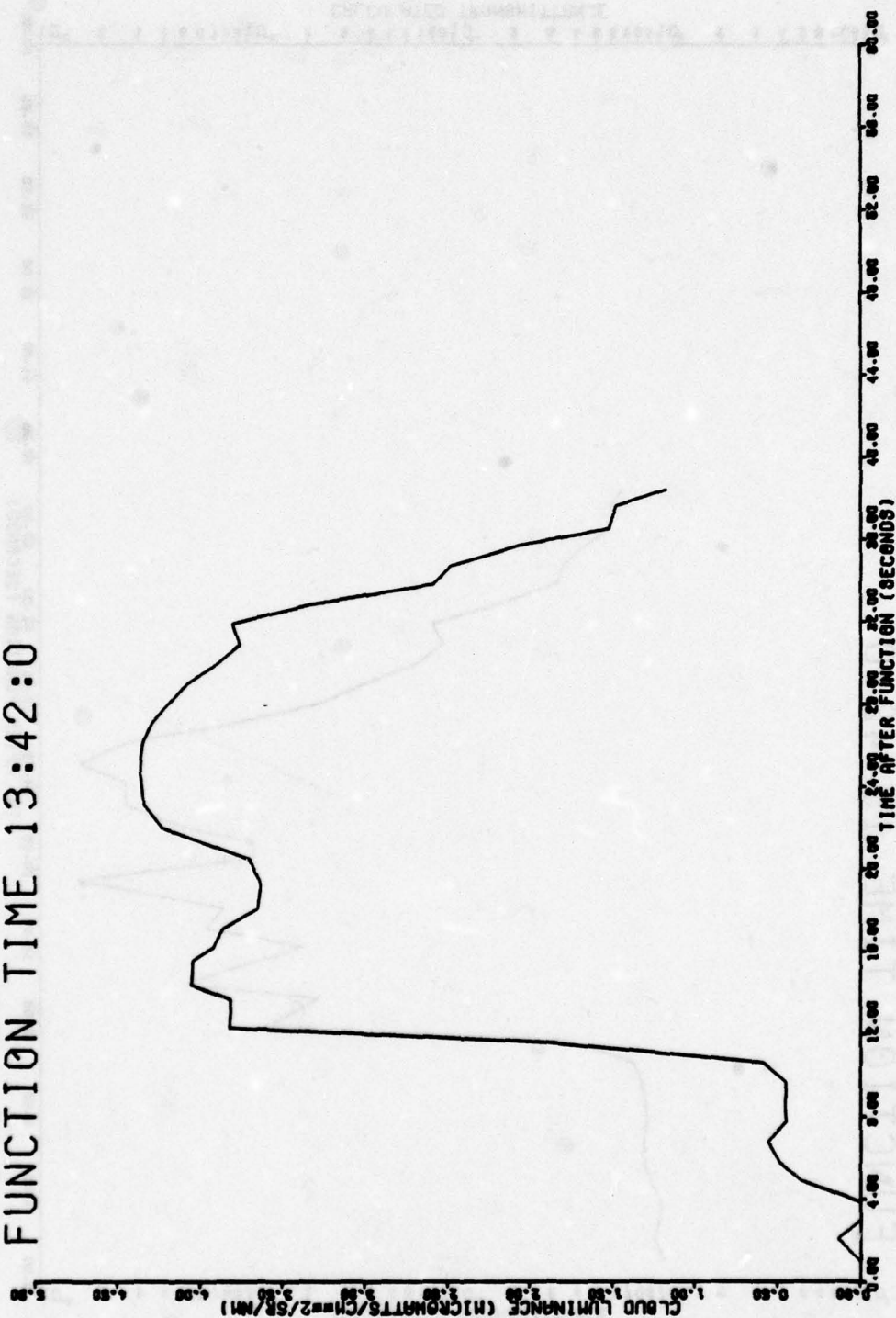
TRANSMITTANCE VERSUS TIME FOR  
 WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #11 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:42:0



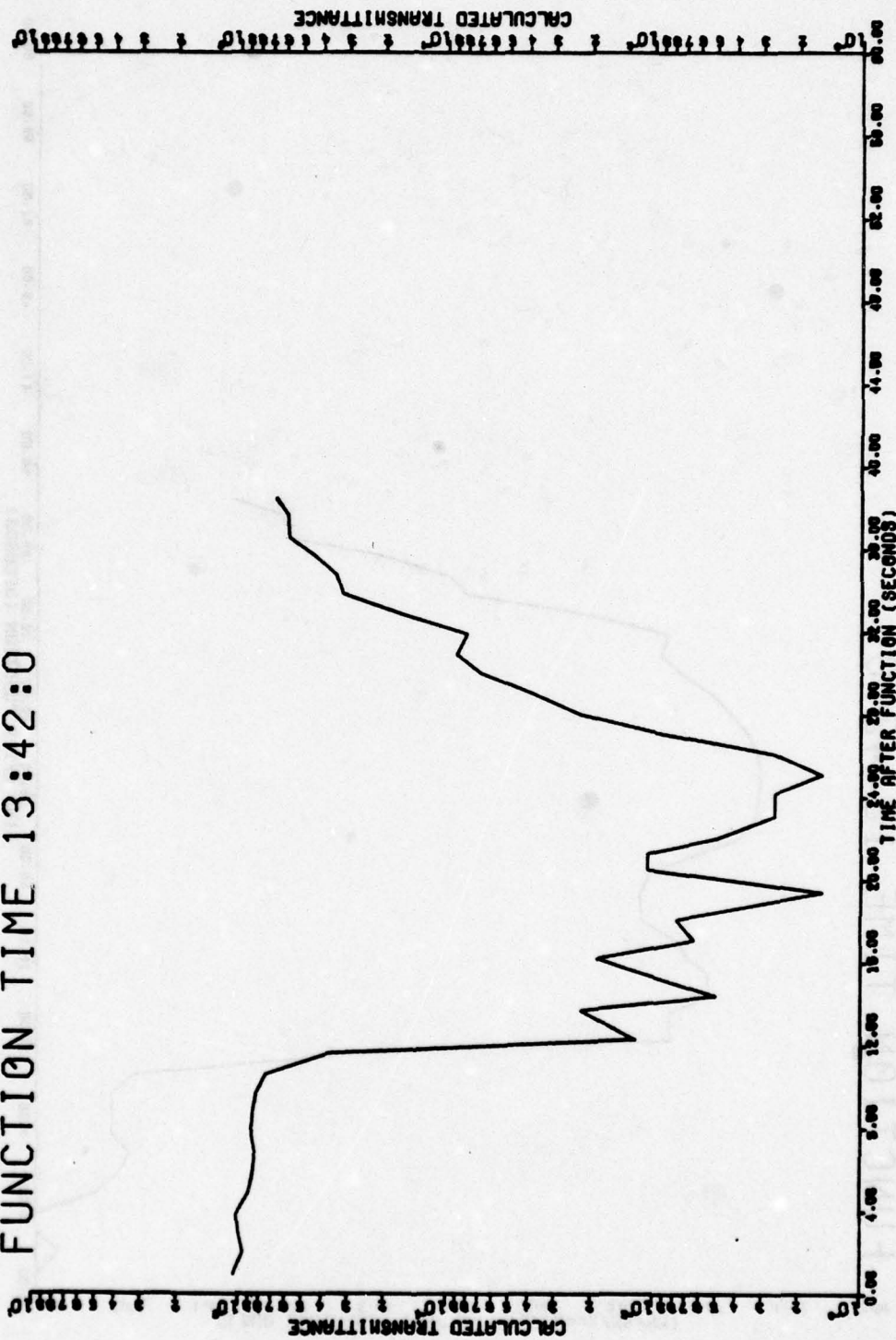
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #11 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:42:0



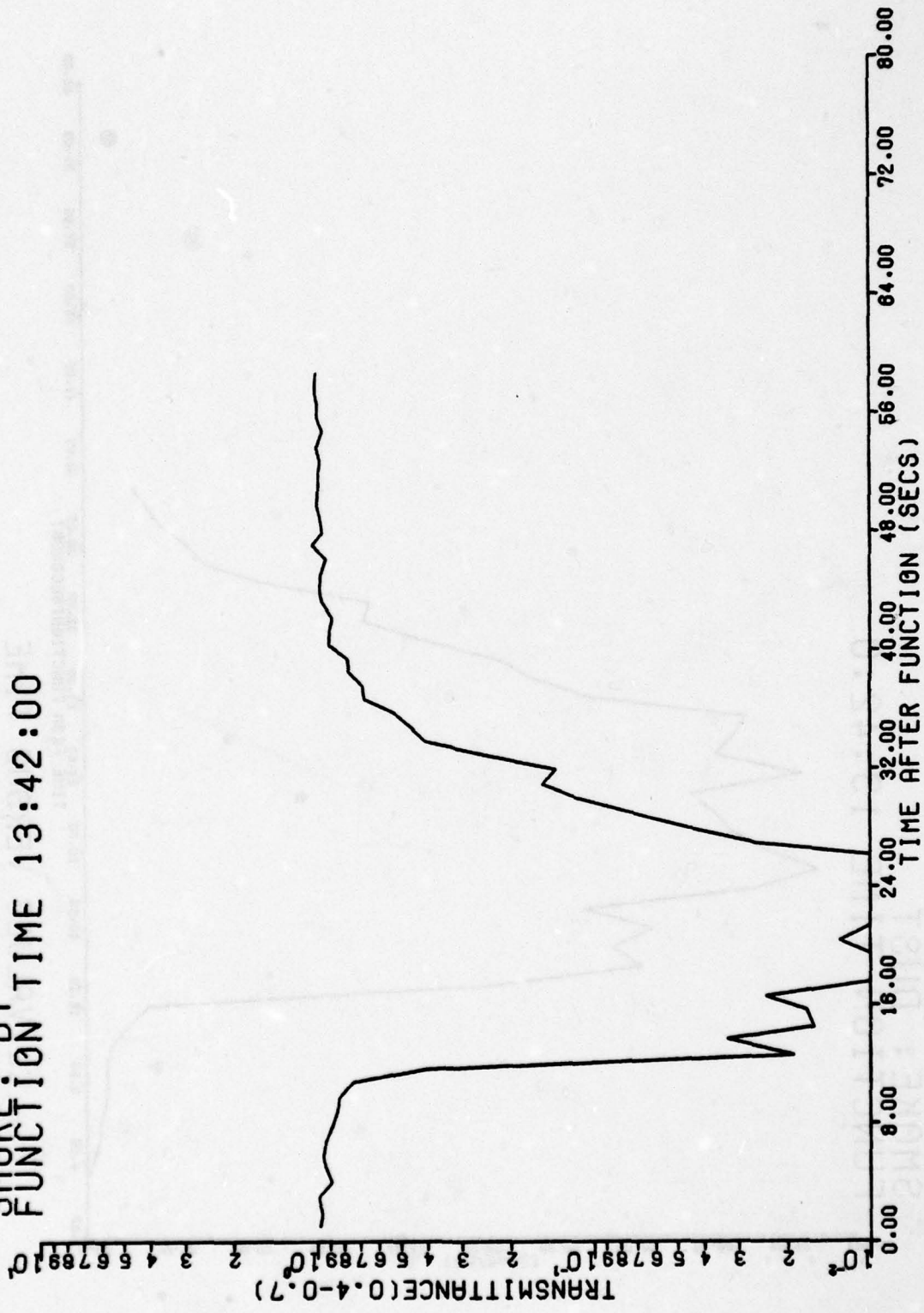
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #11 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 13:42:0



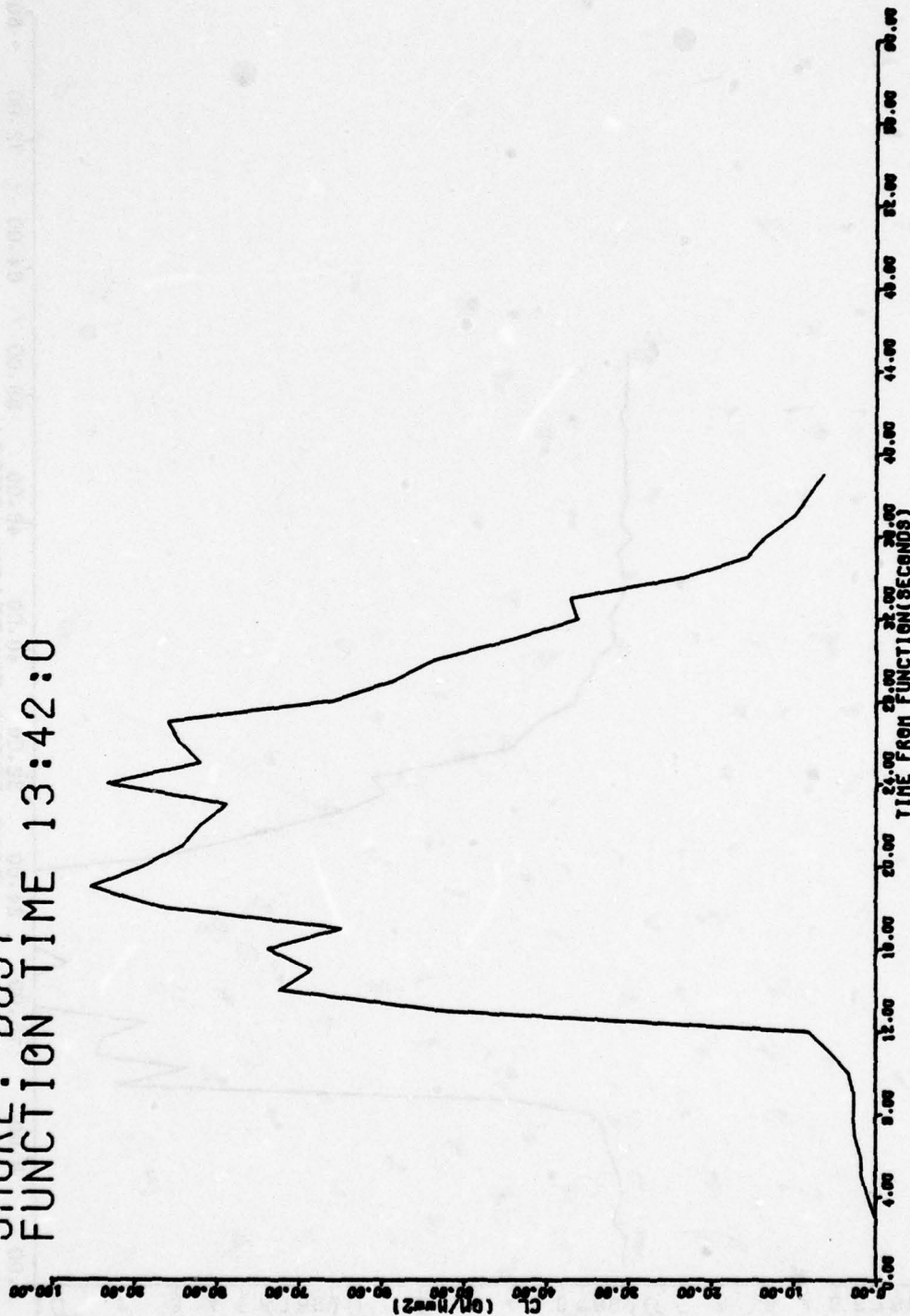
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 (μm)

TRIAL 11: FT: SILL TESTS  
 DATE: 16 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 13:42:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 (μm)

TRIAL #11 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 13:42:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 15

CONTENTS

TRIAL DPI-005-T12 (DUST) 17 MAY 1978

<u>PAGE</u>	
B-15-2	TABLE OF TEST DAY DATA
B-15-3	FIGURE: DOSAGE BY SAMPLING POSITION
B-15-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-15-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-15-6	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-15-7	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-15-8	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-15-9	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-15-10	FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

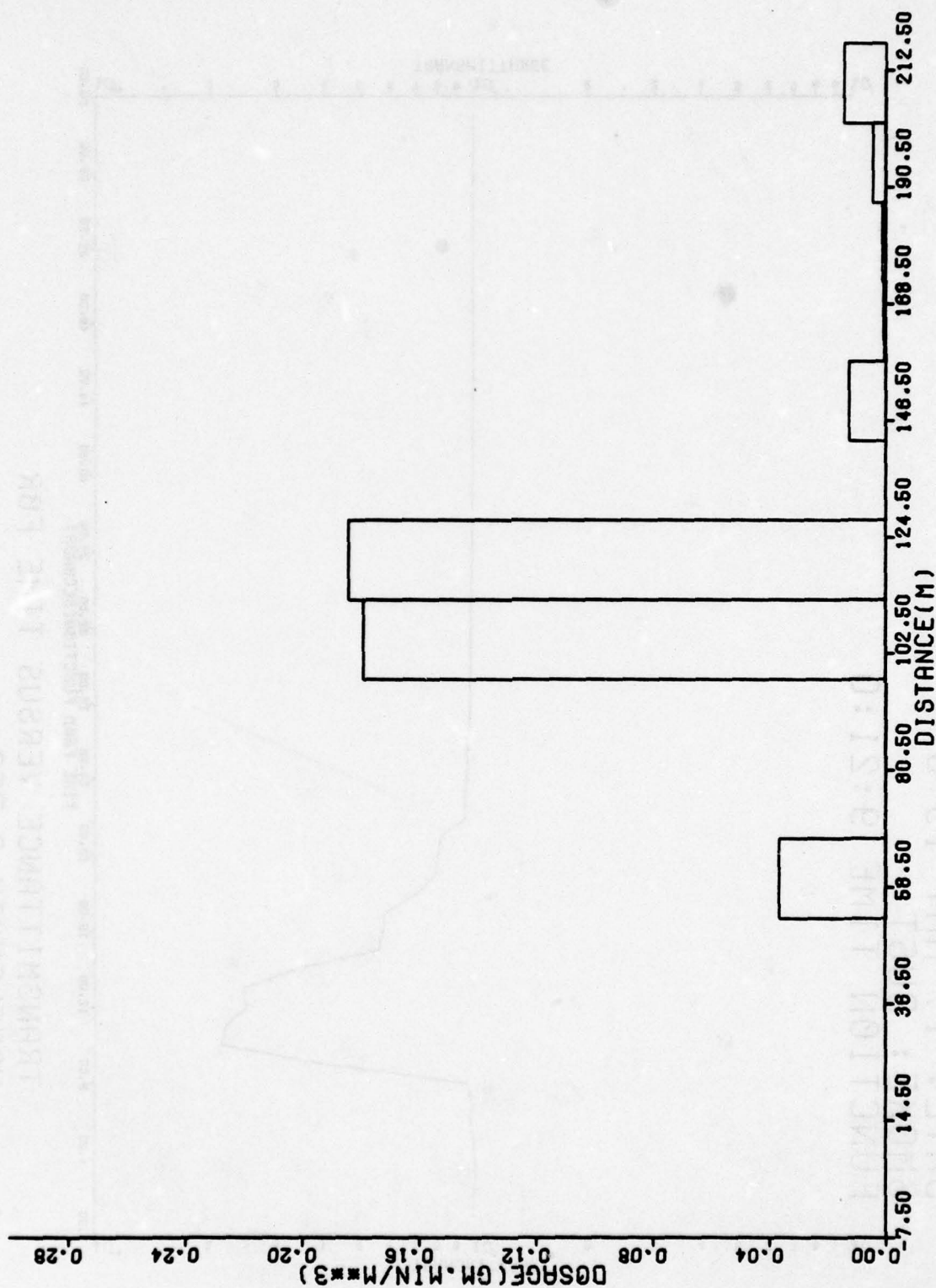
TRIAL: DPI-005-T12

DATE: 17 May 1978

TIME: 0921

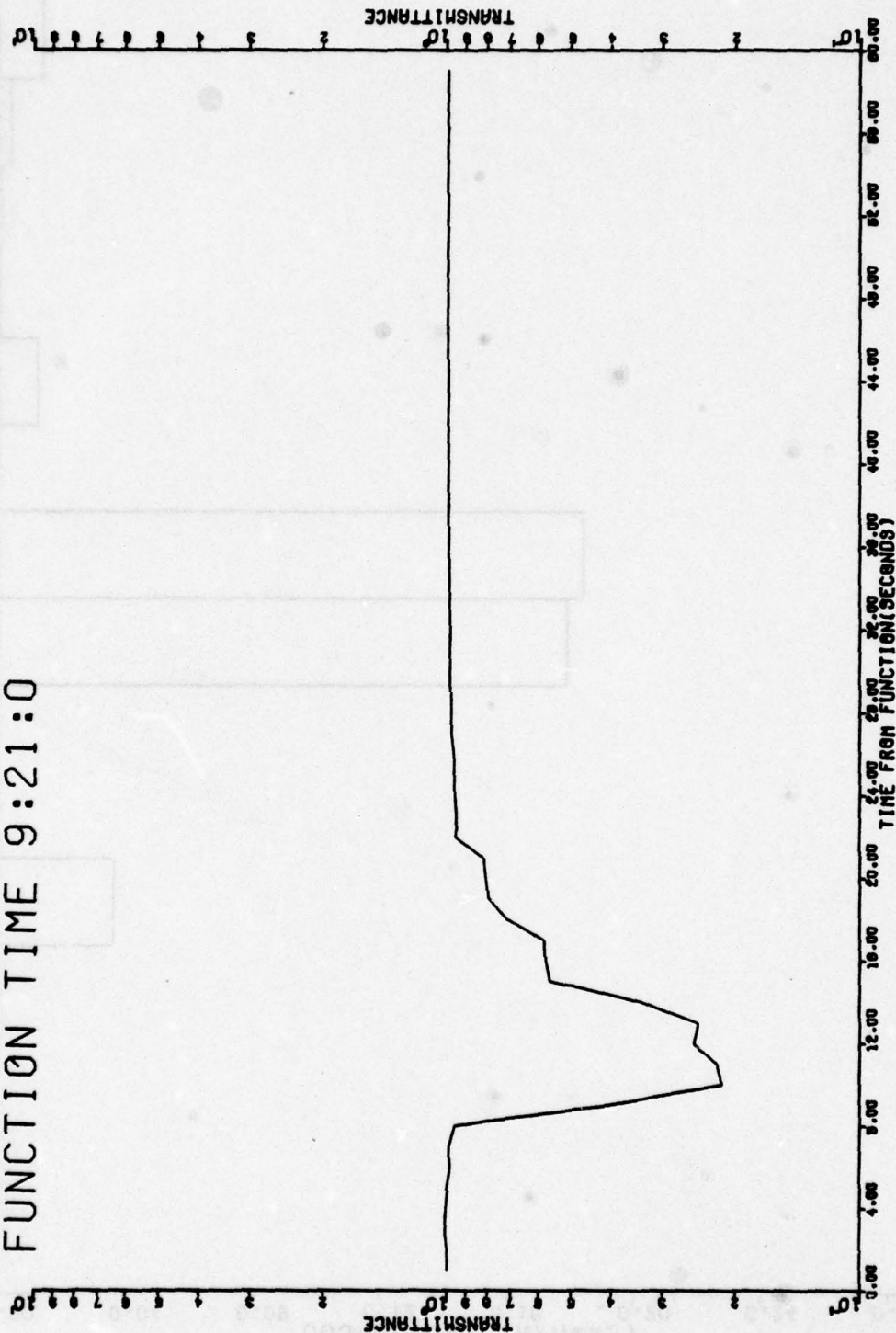
Wind Direction, degrees (2 meter) . . . . .	111
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	5.9
Relative Humidity, Percent (2 meter) . . . . .	82
Temperature . . . . .	62°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	NR
Range (meter) . . . . .	NR
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.59
1.3 - 2.3 . . . . .	0.41
2.3 - 10.0 . . . . .	0.00
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	< 1.33*

\*This figure represents an upper bound to the NMD, since it is not possible to compute an NMD with probit analysis or to obtain a graphical estimate.



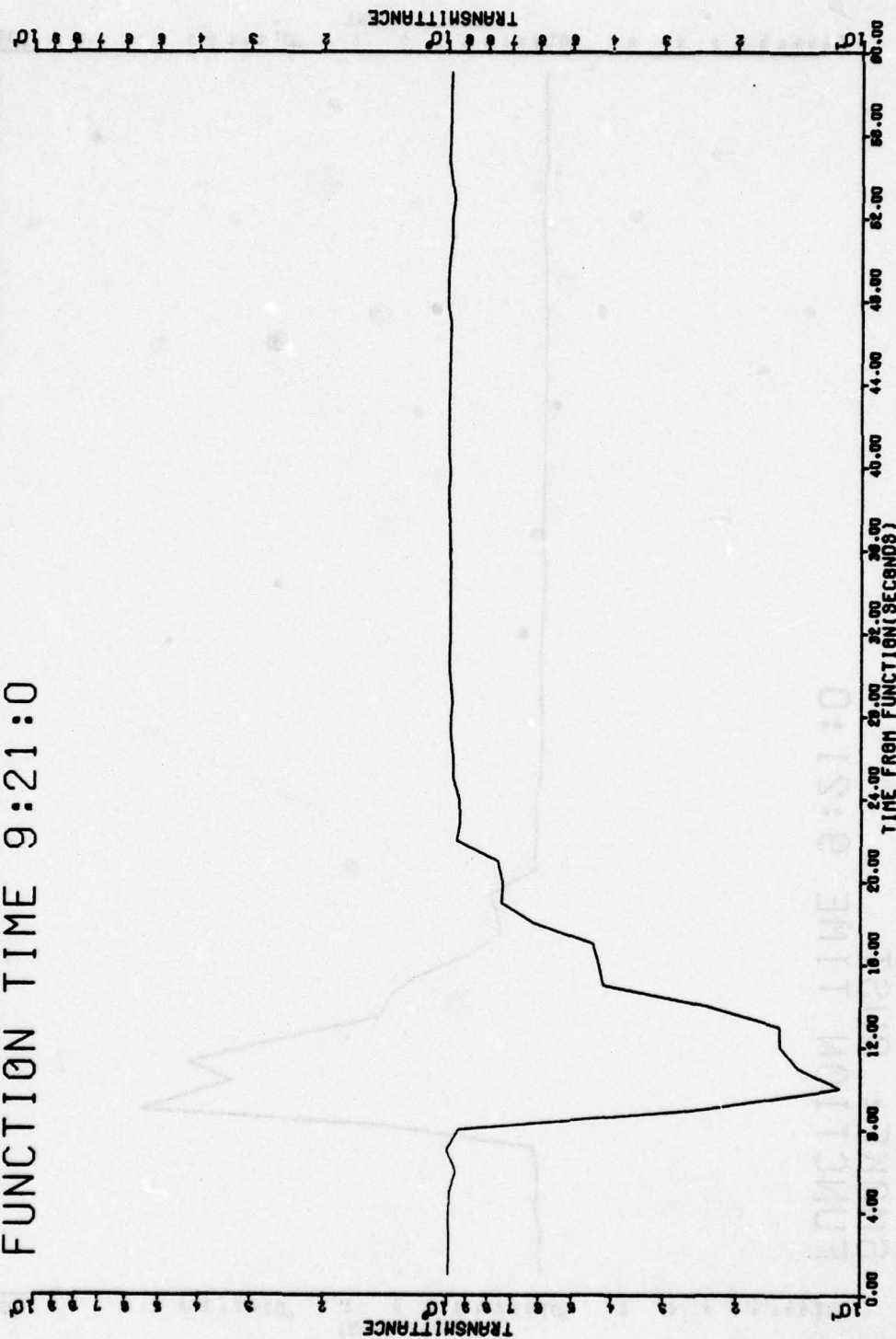
TRIAL 12, FT. SILL TESTS, 17 MAY 78, 09:21:00, DUST

TRIAL #12 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:21:0



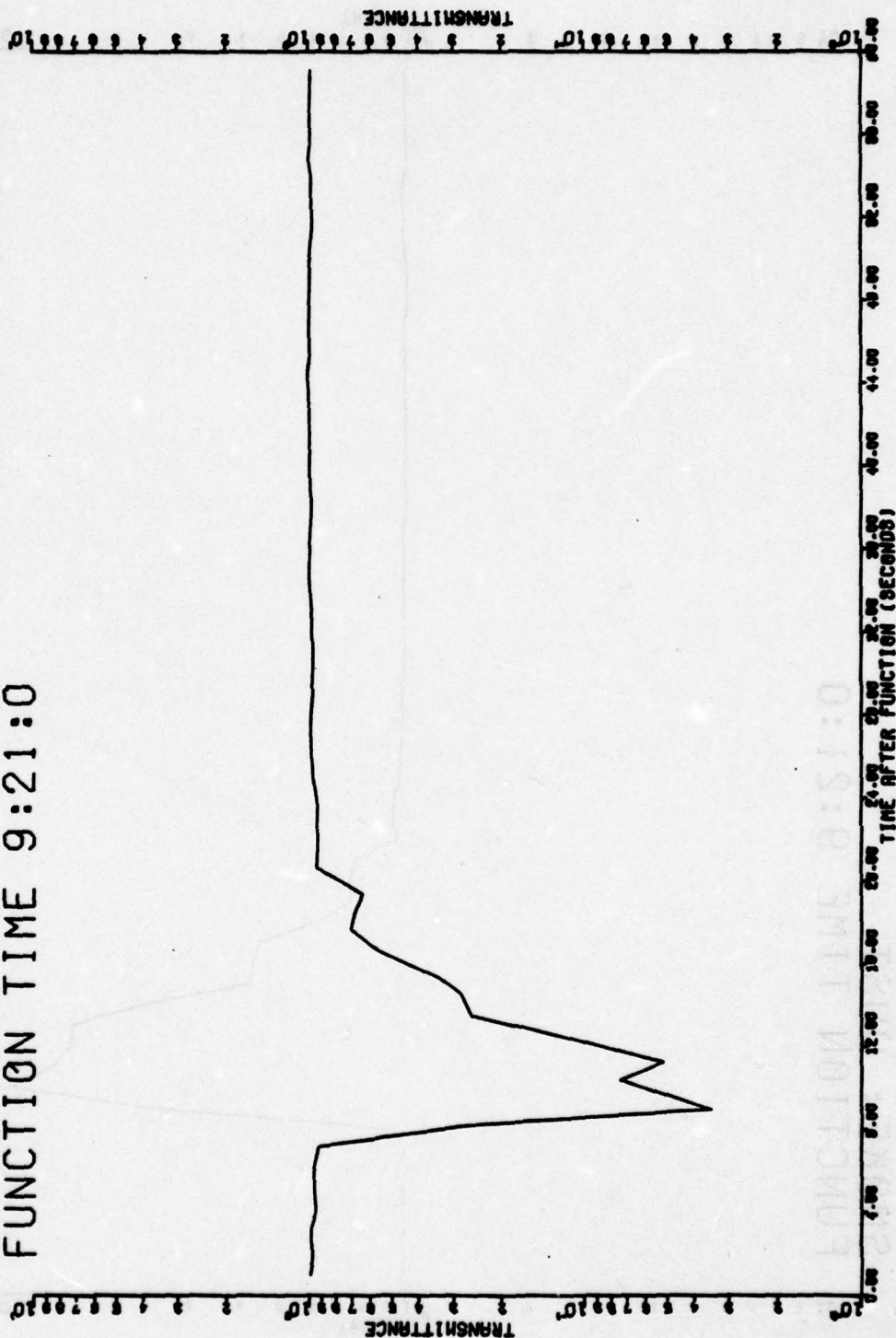
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #12 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:21:0



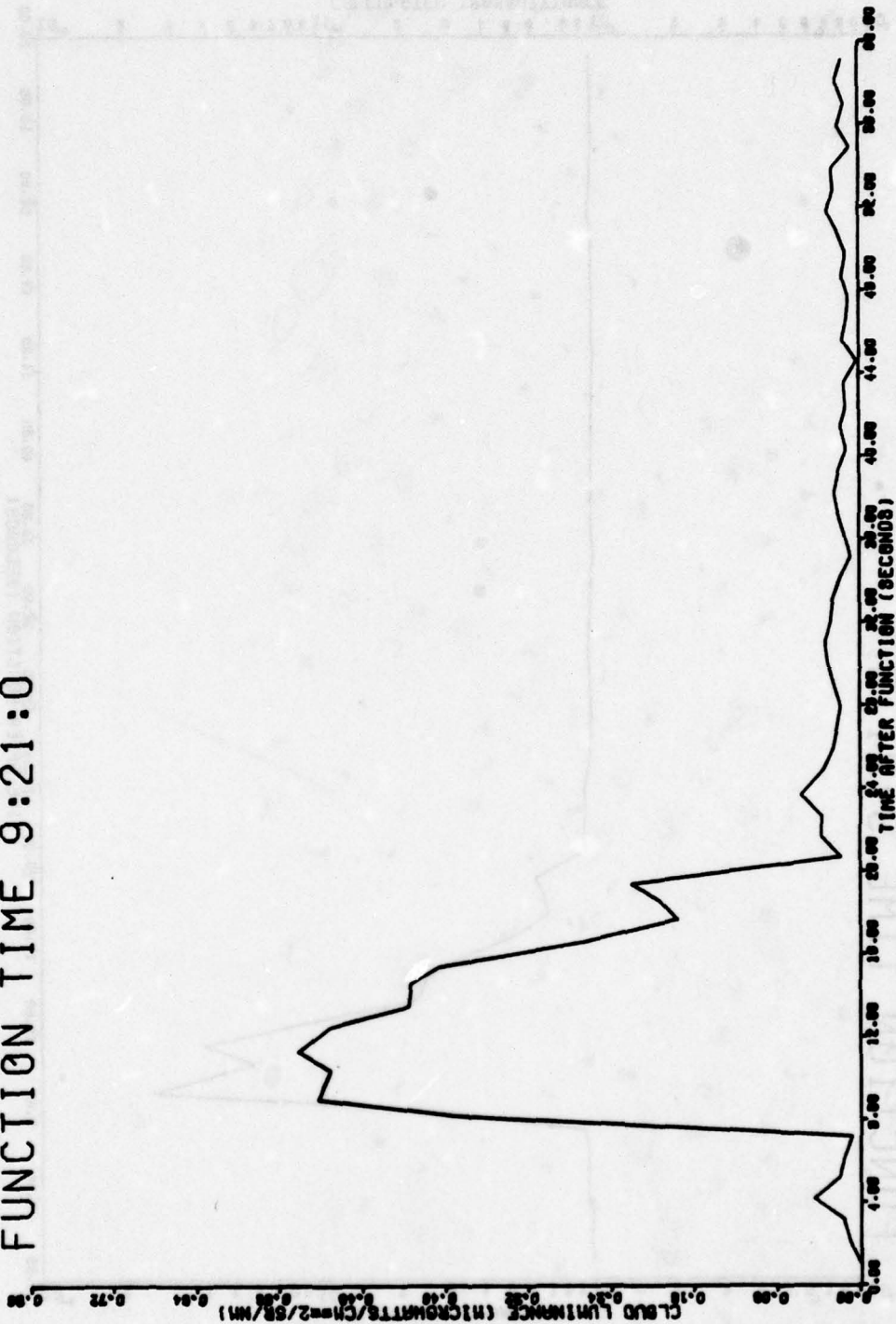
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #12 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:21:0



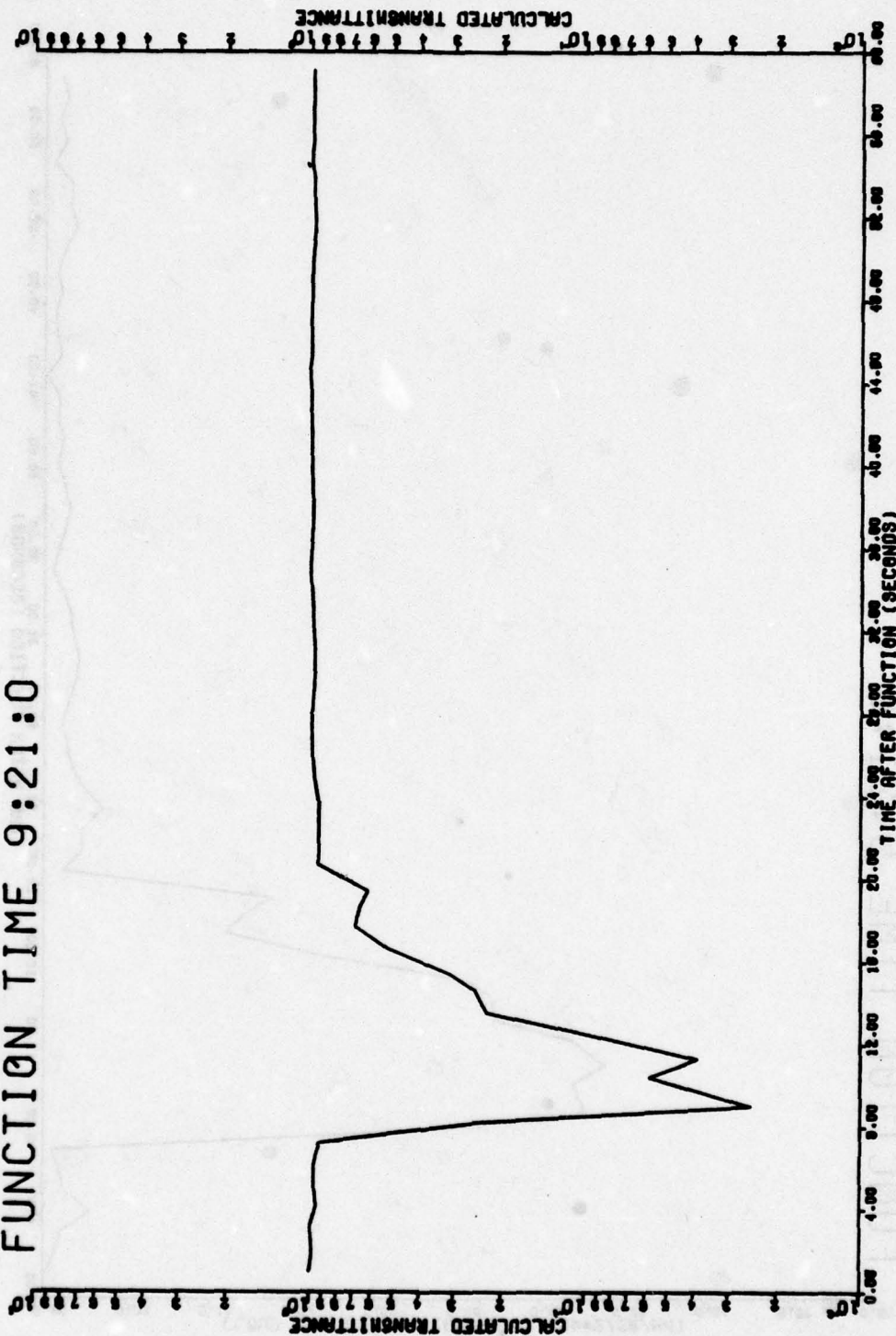
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #12 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:21:0



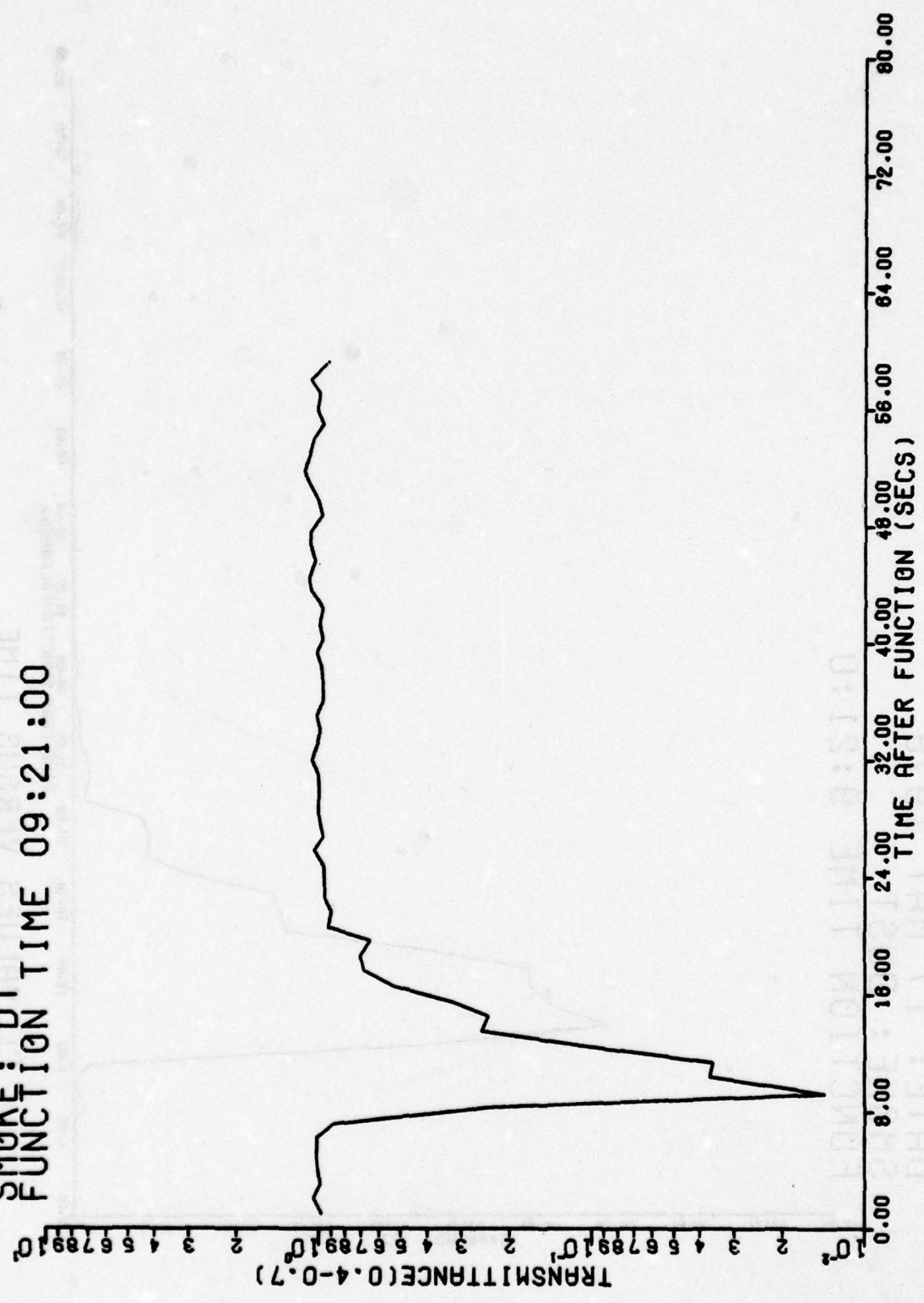
CLOUD LUMINANCE VERSUS TIME FOR  
 WAVELENGTH 1.060 (μm)

TRIAL #12 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:21:0



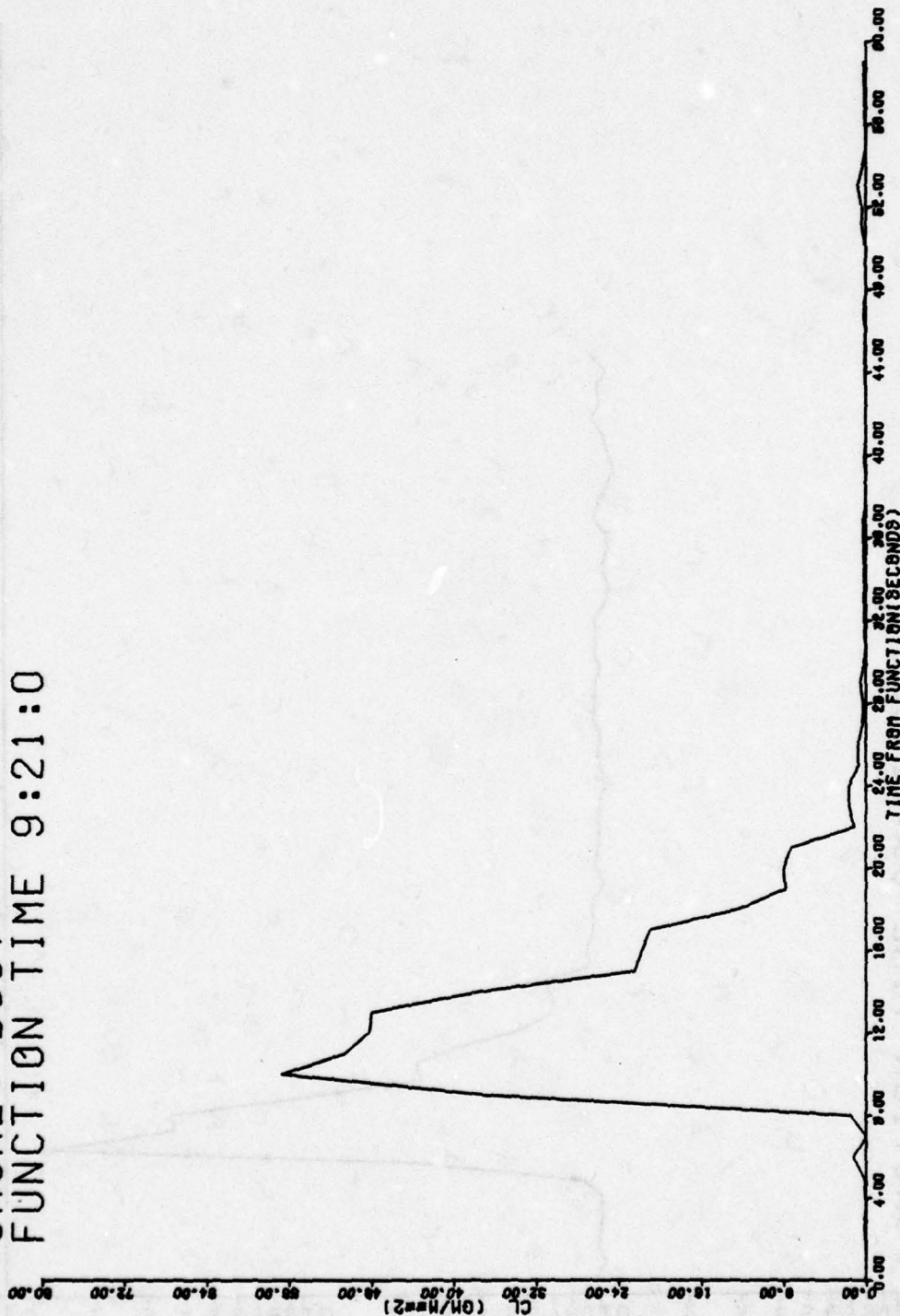
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 (μm)

TRIAL 12; FT. SILL TESTS  
 DATE: 17 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 09:21:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 (um)

TRIAL #12 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:21:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 16

CONTENTS

TRIAL DPI-005-T13 (DUST) 17 MAY 1978

<u>PAGE</u>	
B-16-2	TABLE OF TEST DAY DATA
B-16-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-16-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-16-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-16-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-16-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-16-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-16-9	FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T13

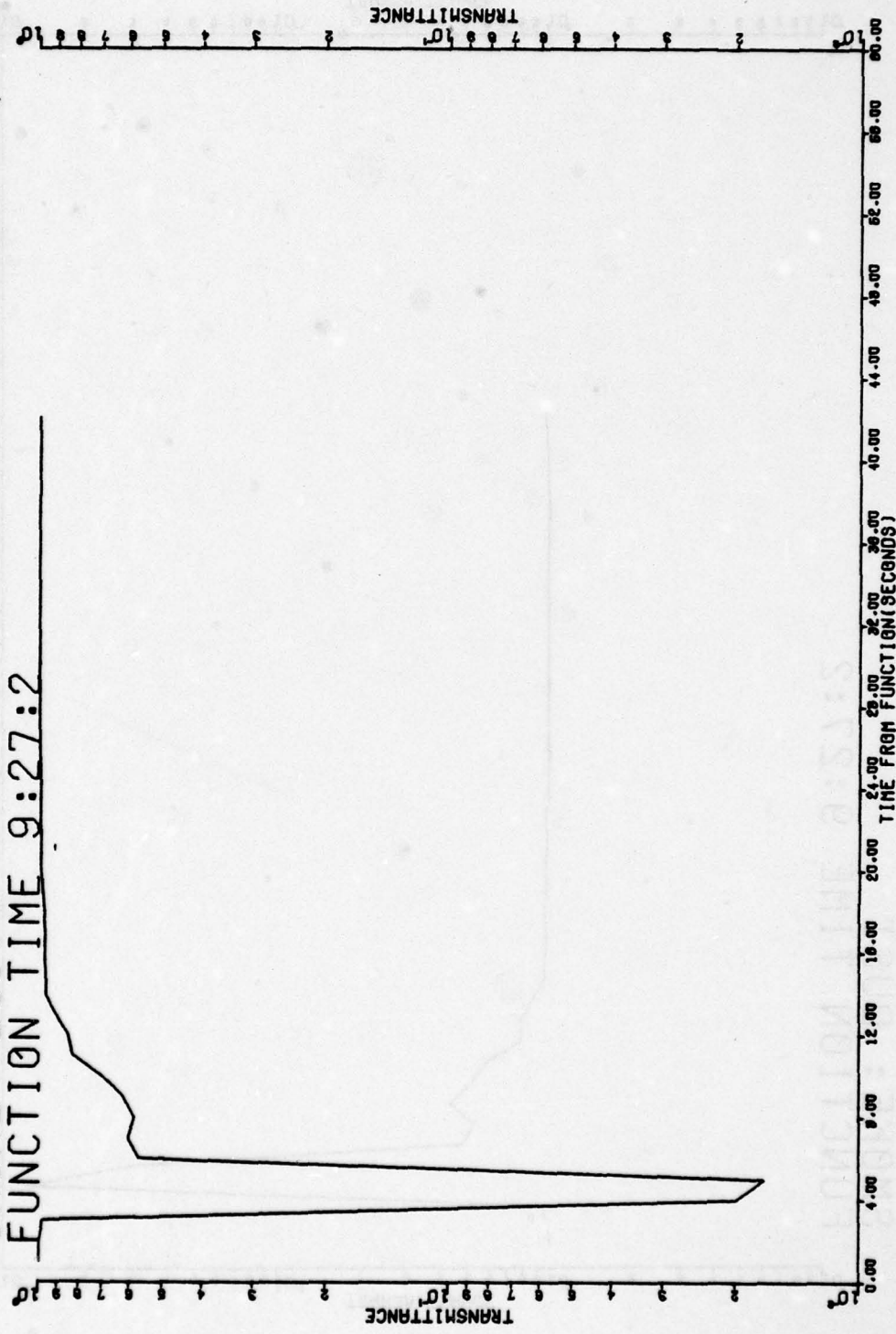
DATE: 17 May 1978

TIME: 0927

Wind Direction, degrees (2 meter) . . . . .	117
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.6
Relative Humidity, percent (2 meter) . . . . .	82
Temperature . . . . .	62°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	NR
Range (meter) . . . . .	NR
Particle Size Range ( $\mu\text{m}$ ) . . . . .	Proportion
0.65 - 1.3 . . . . .	0.58
1.3 - 2.3 . . . . .	0.42
2.3 - 10.0 . . . . .	0.00
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD (microns) . . . . .	< 1.3*

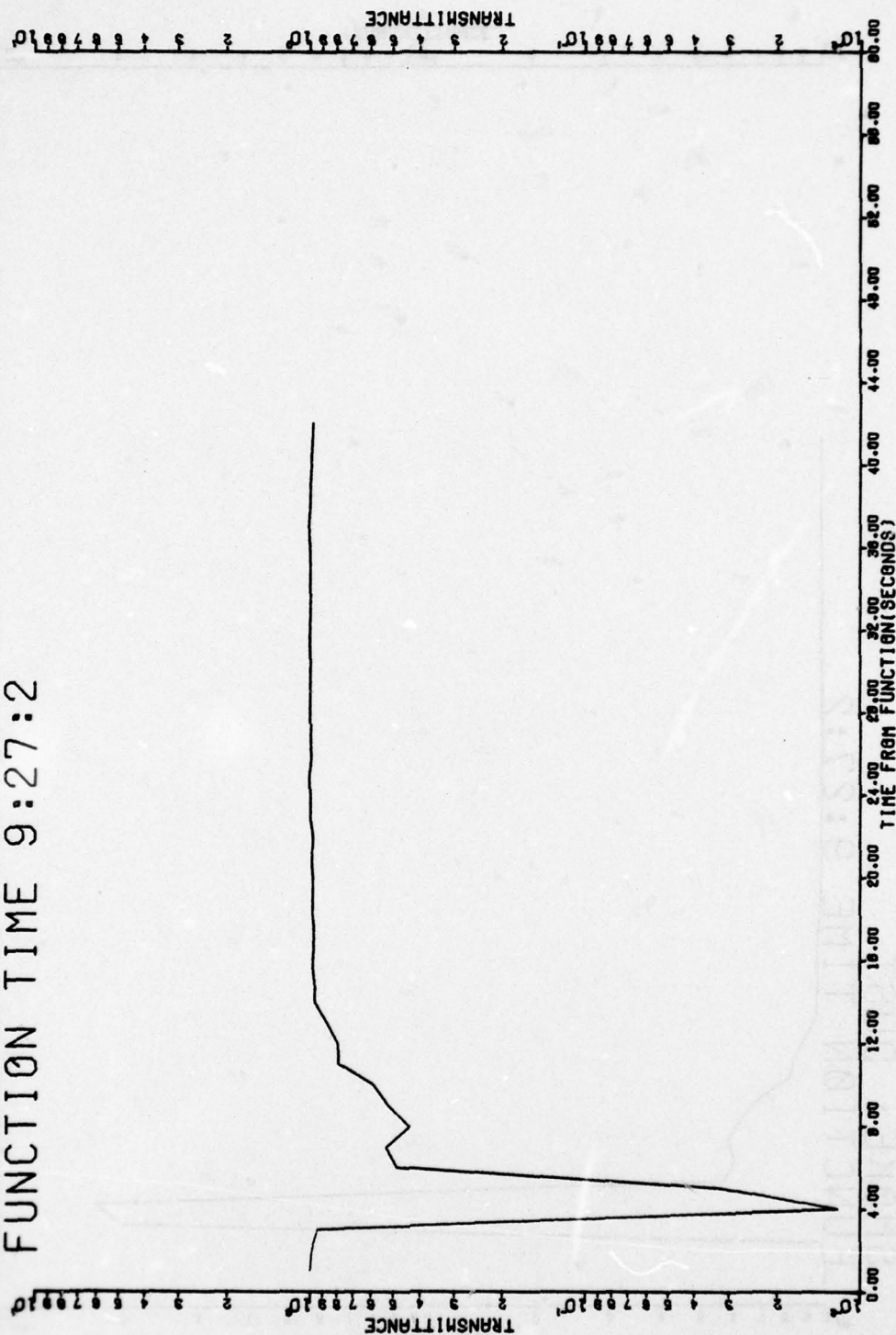
\*This figure represents an upper bound to the NMD, since it is not possible to compute an NMD with probit analysis or to obtain a graphical estimate.

TRIAL #13 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:27:2



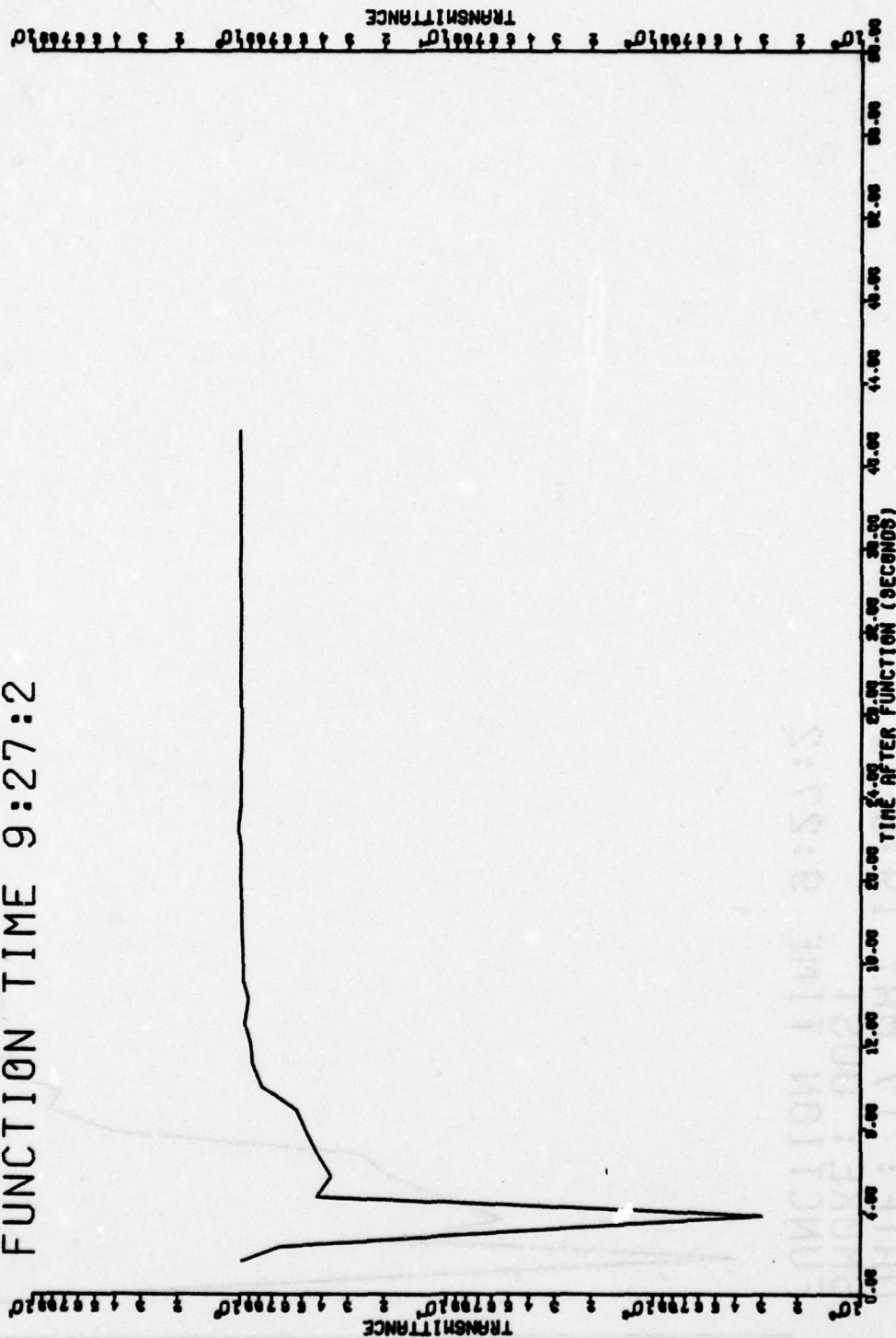
TRANSMITTANCE VERSUS TIME FOR  
 WAVELENGTH 9.750 (um)

TRIAL #13 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:27:2



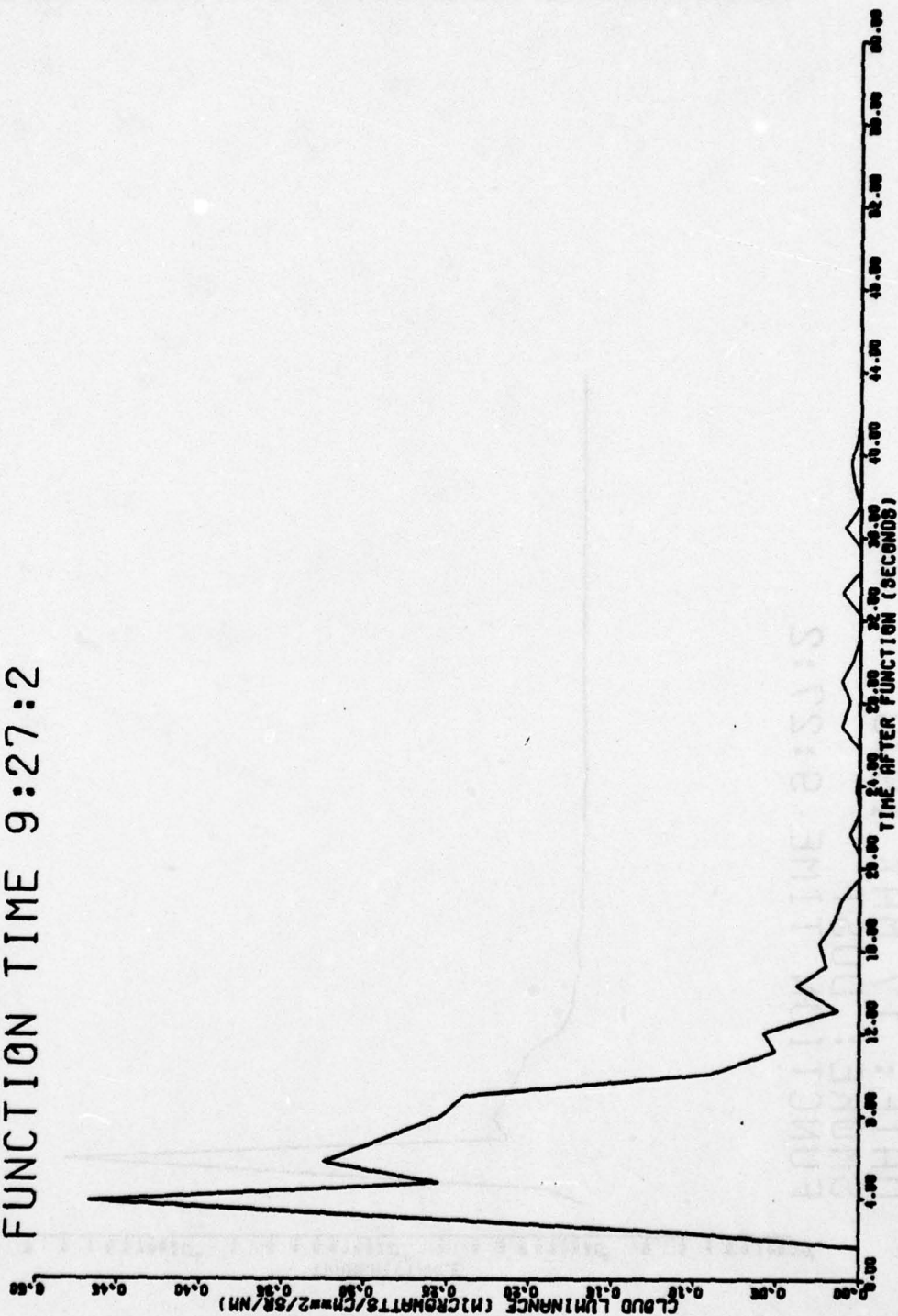
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #13 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:27:2



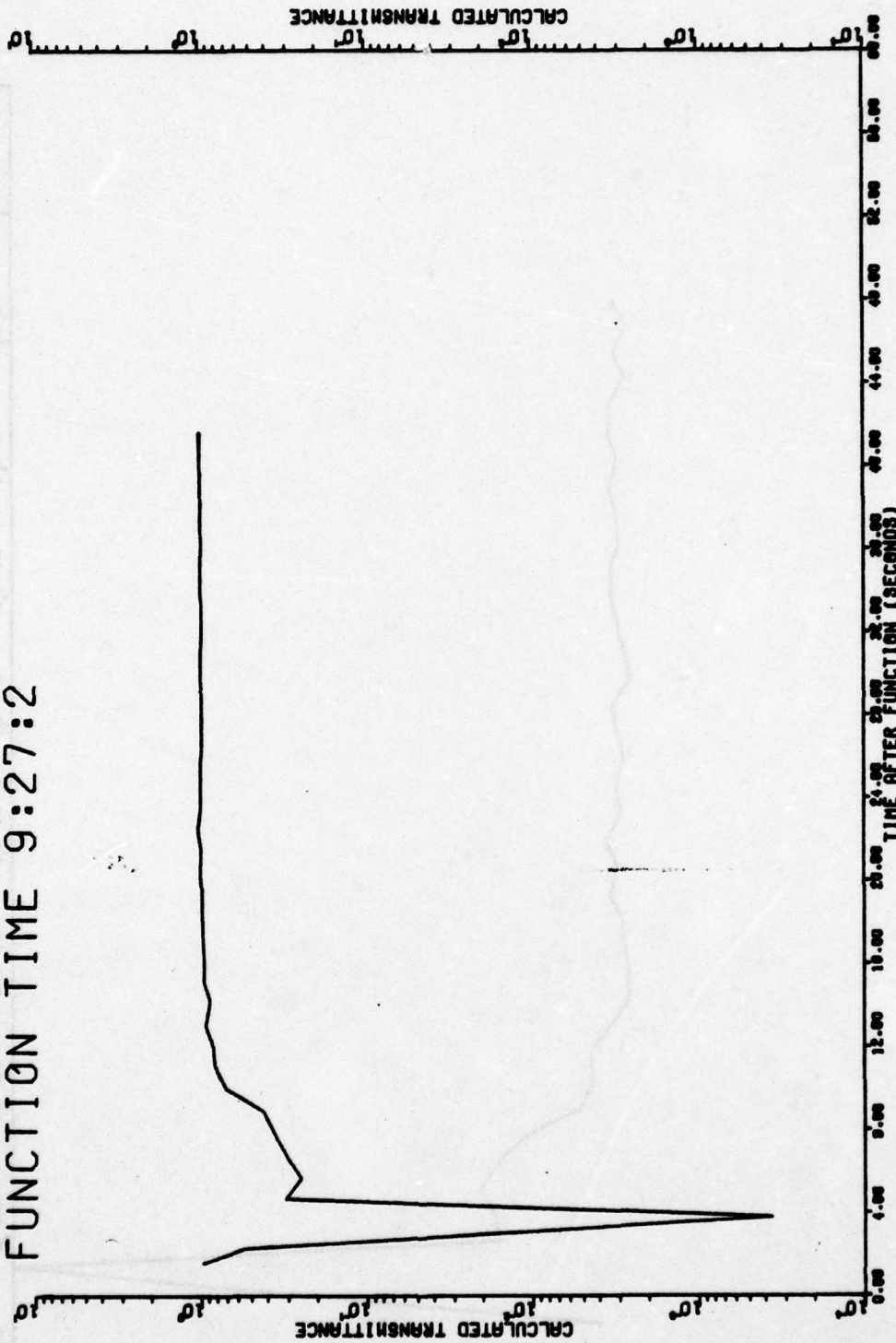
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #13 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:27:2



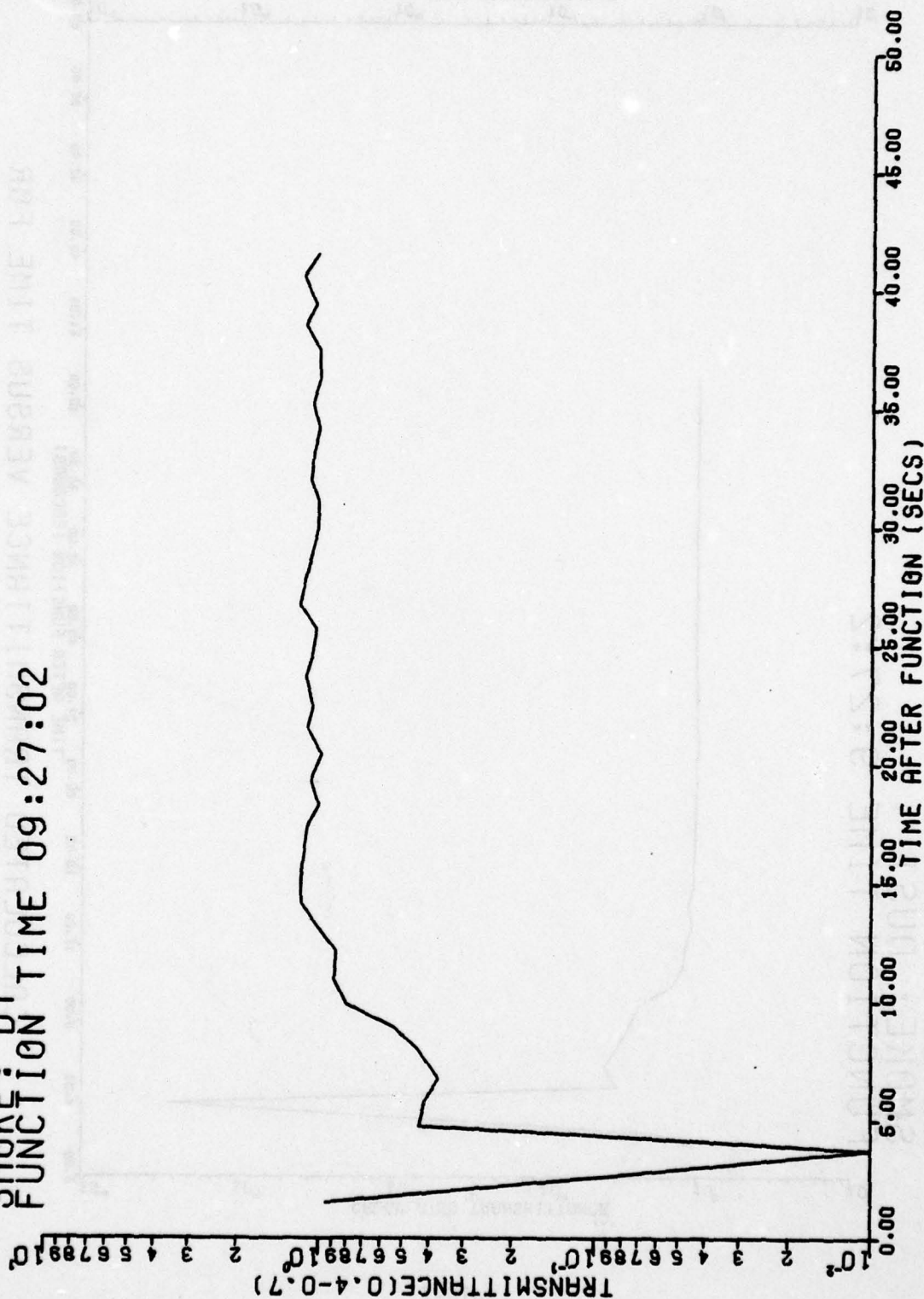
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #13 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:27:2



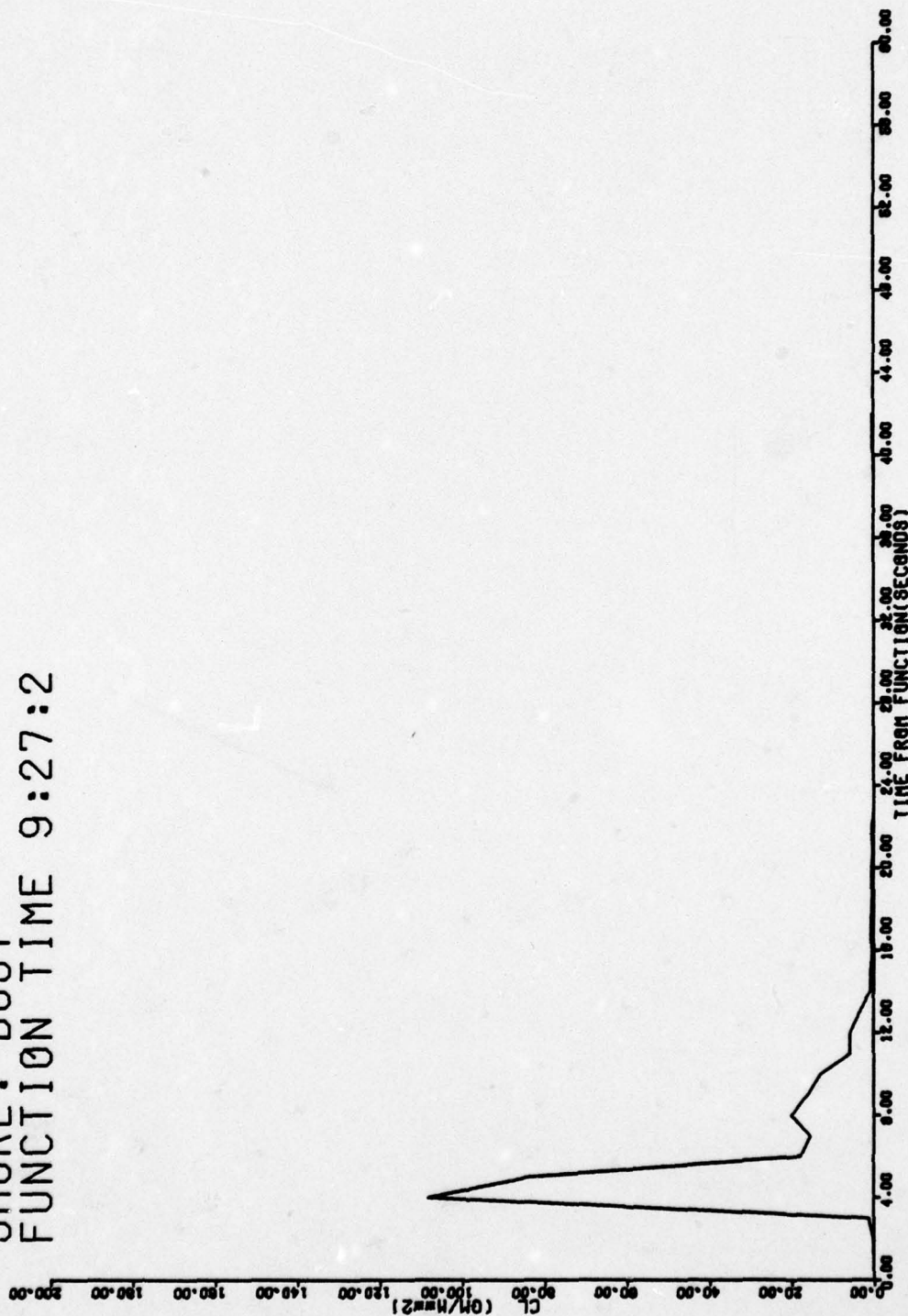
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 13, FT. SILL TESTS  
 DATE: 17 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 09:27:02



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 (μm)

TRIAL #13 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:27:2



CL VALUES VERSUS TIME  
CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 17

CONTENTS

TRIAL DPI-005-T14 (DUST) 17 MAY 1978

PAGE	
B-17-2	TABLE OF TEST DAY DATA
B-17-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-17-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-17-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-17-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-17-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-17-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-17-9	FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T14

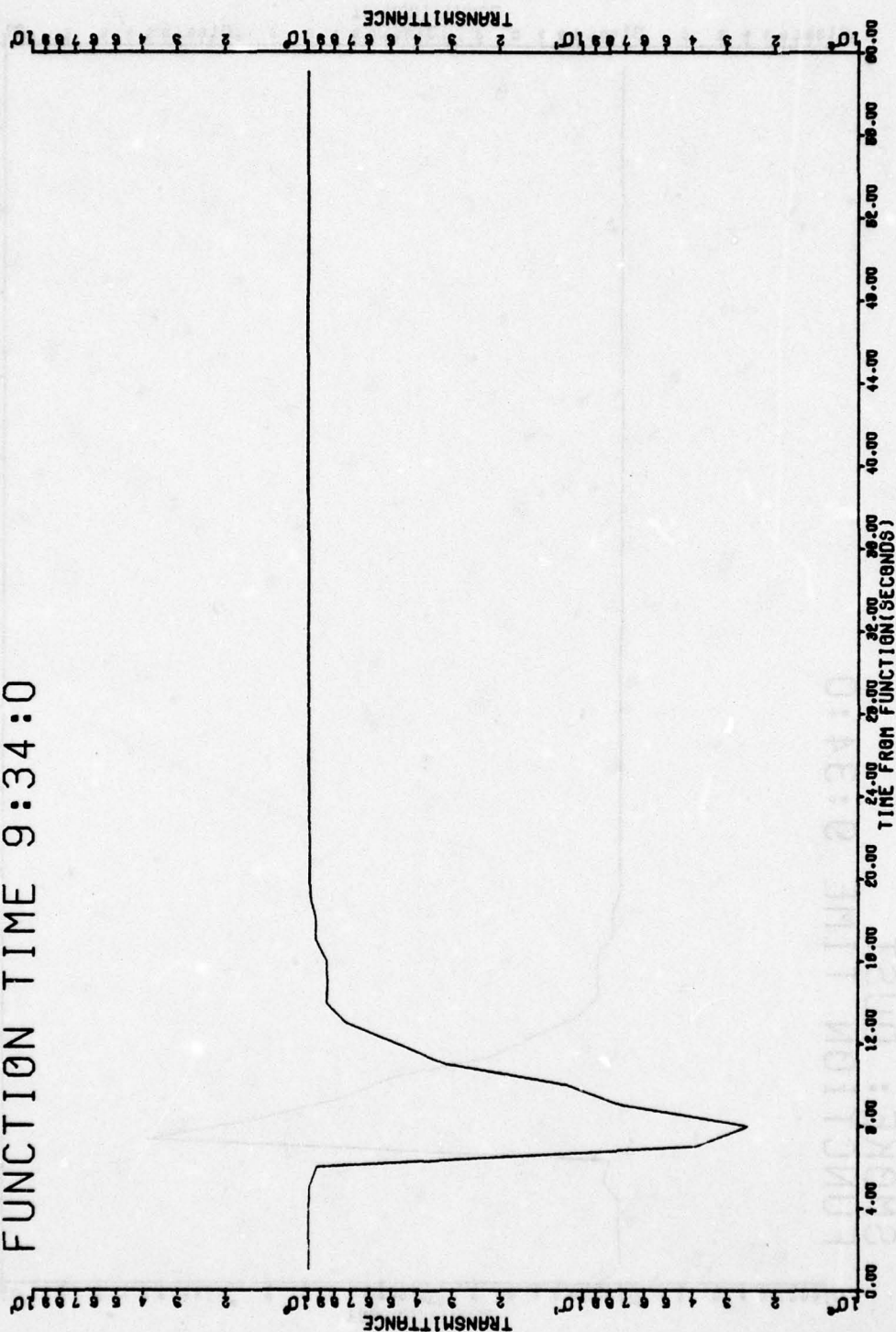
DATE: 17 May 1978

TIME: 0934

Wind Direction, degrees (2 meter) . . . . .	112
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.3
Relative Humidity, percent (2 meter) . . . . .	82
Temperature . . . . .	62°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	NR
Range (meter) . . . . .	NR
Particle Size Range ( $\mu\text{m}$ ) . . . . .	Proportion
0.65 - 1.3 . . . . .	0.62
1.3 - 2.3 . . . . .	0.38
2.3 - 10.0 . . . . .	0.00
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	< 1.3*

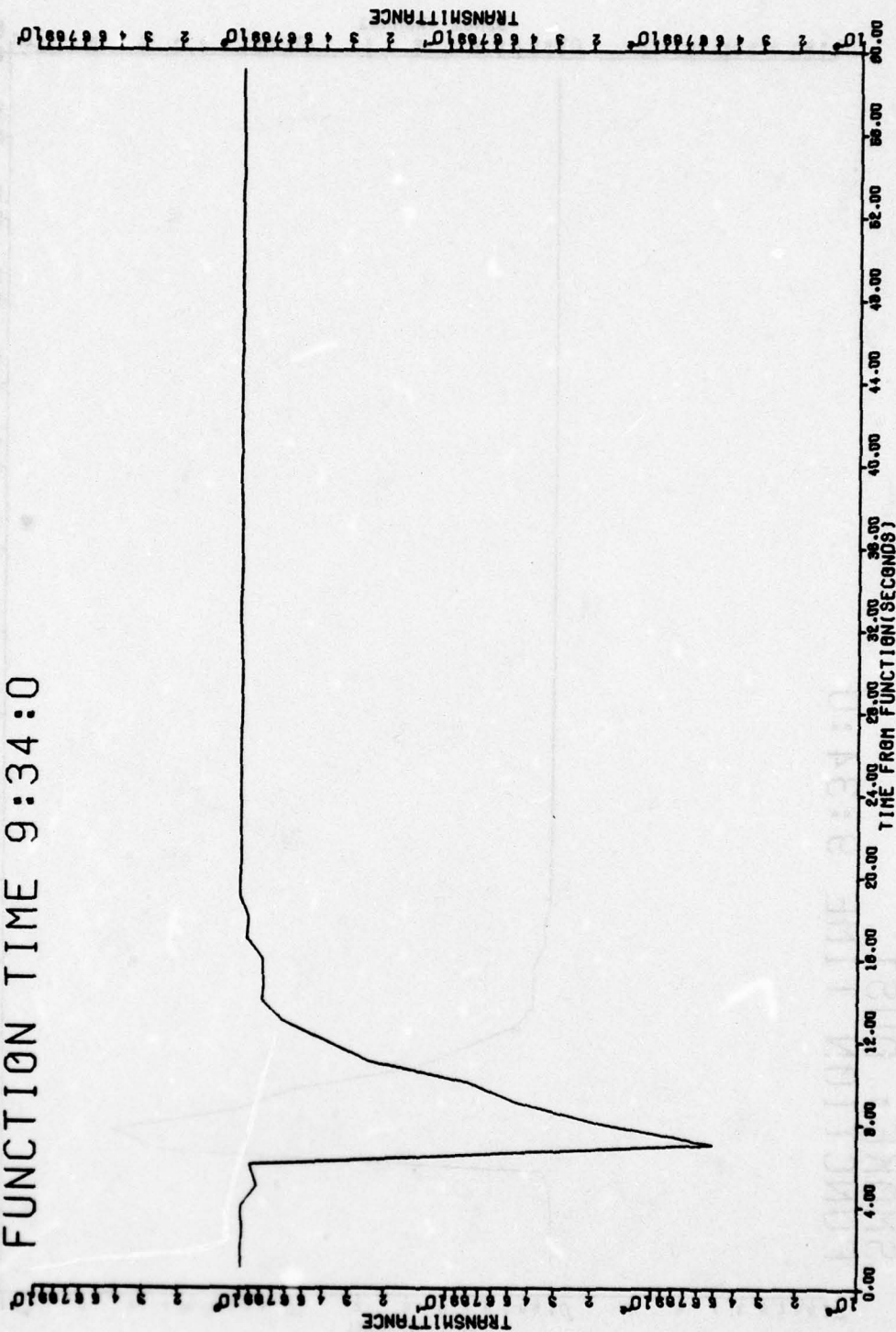
\*This figure represents an upper bound to the NMD, since it is not possible to compute an NMD with probit analysis or to obtain a graphical estimate.

TRIAL #14 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:34:0



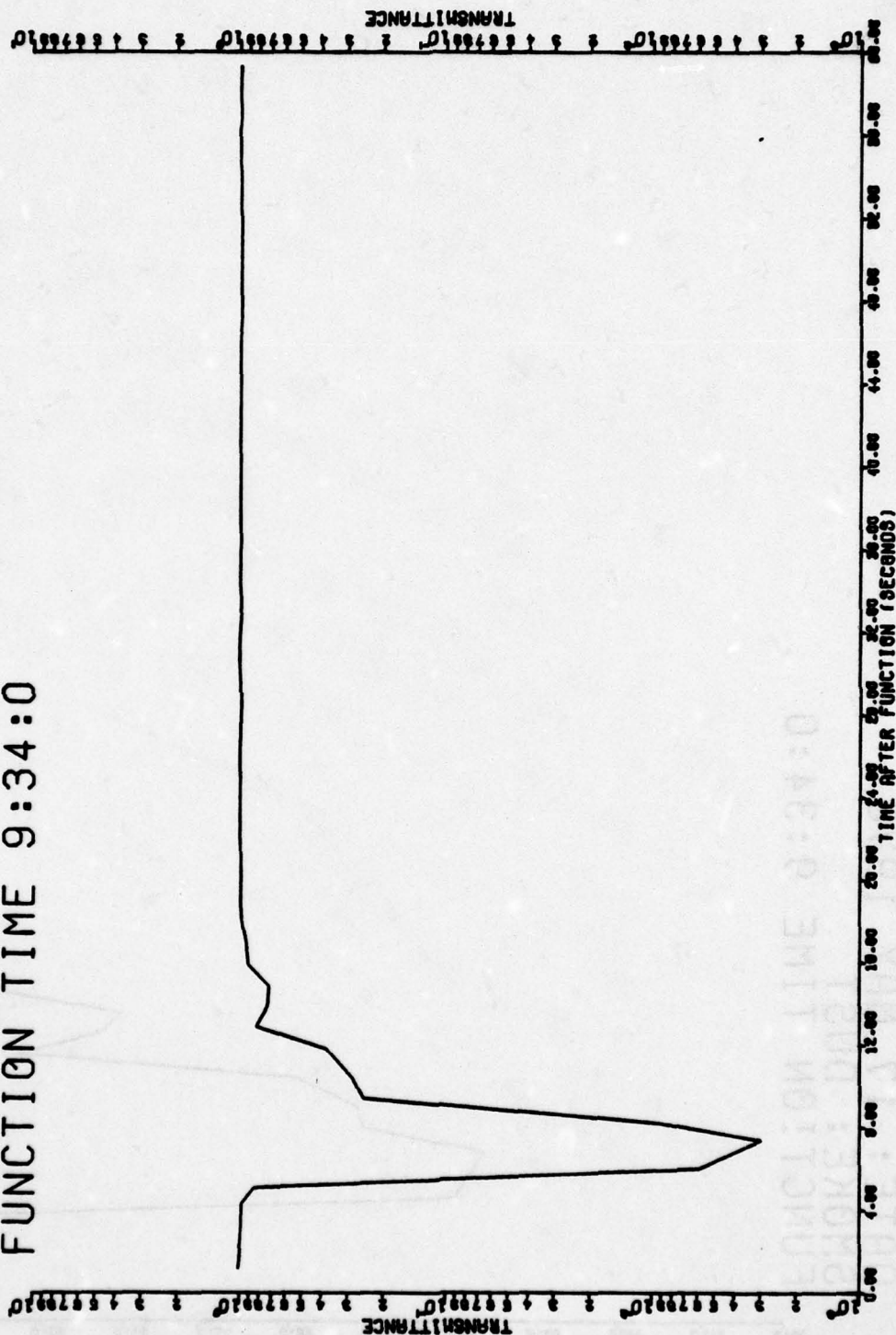
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #14 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:34:0



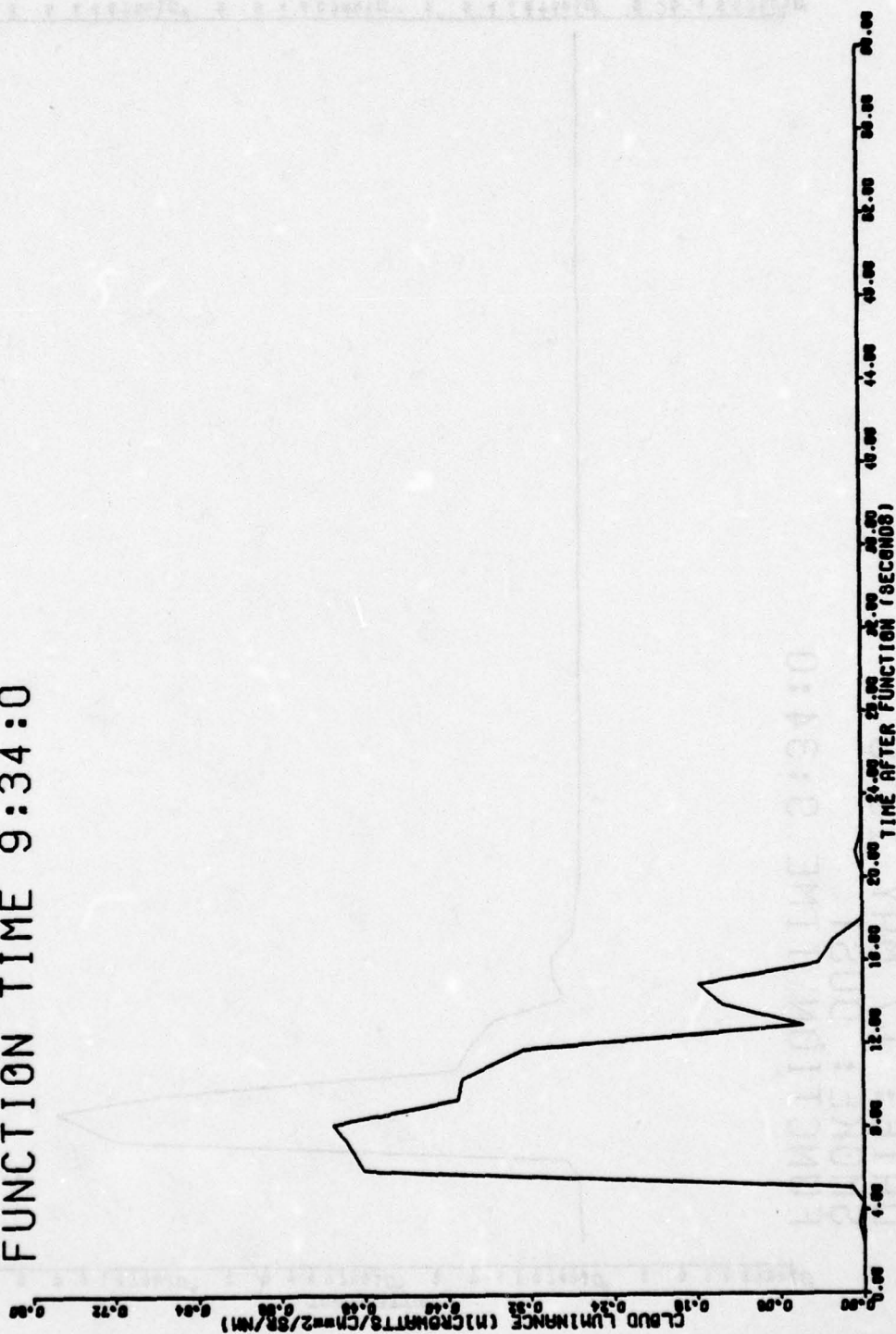
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #14 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:34:0



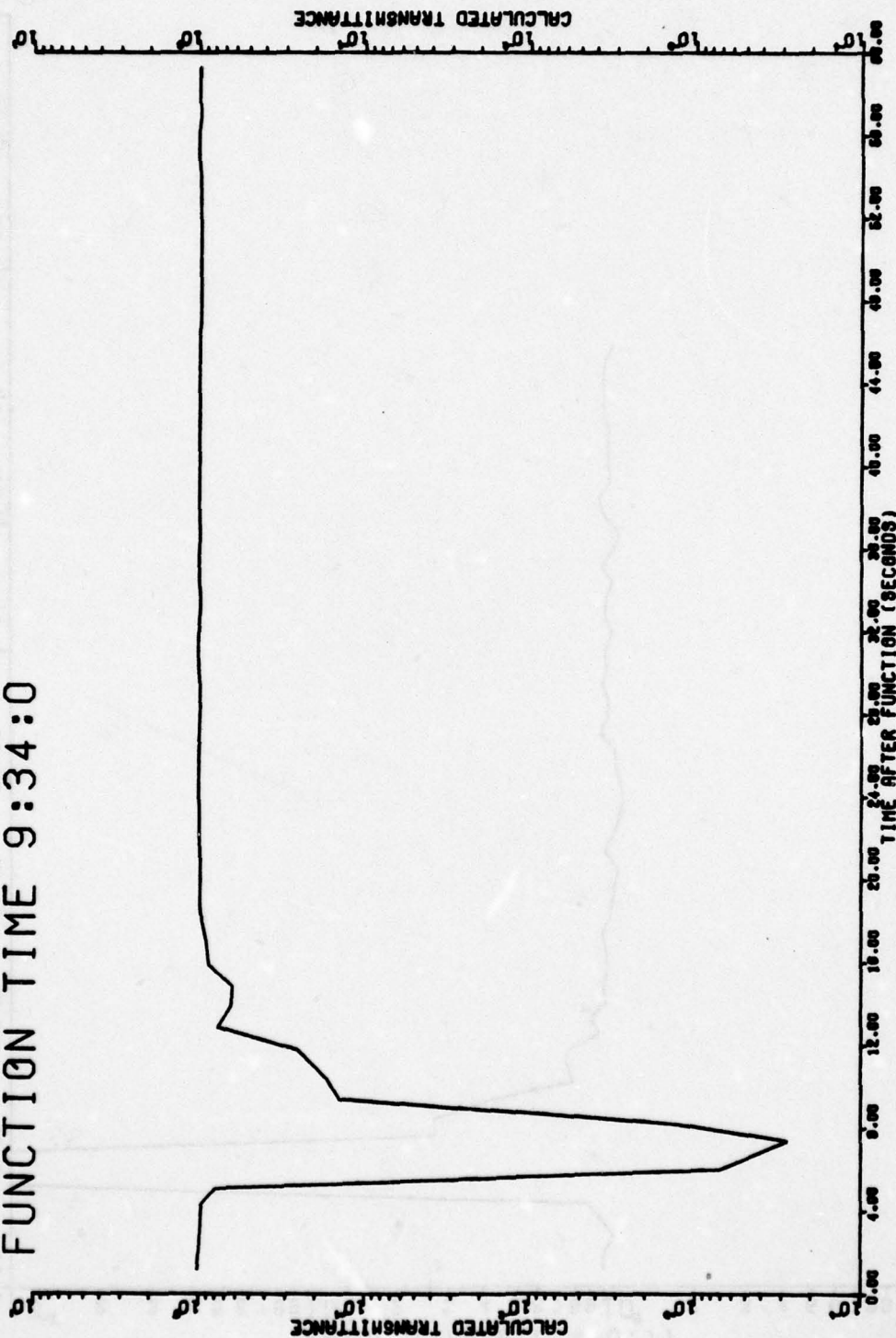
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #14 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:34:0



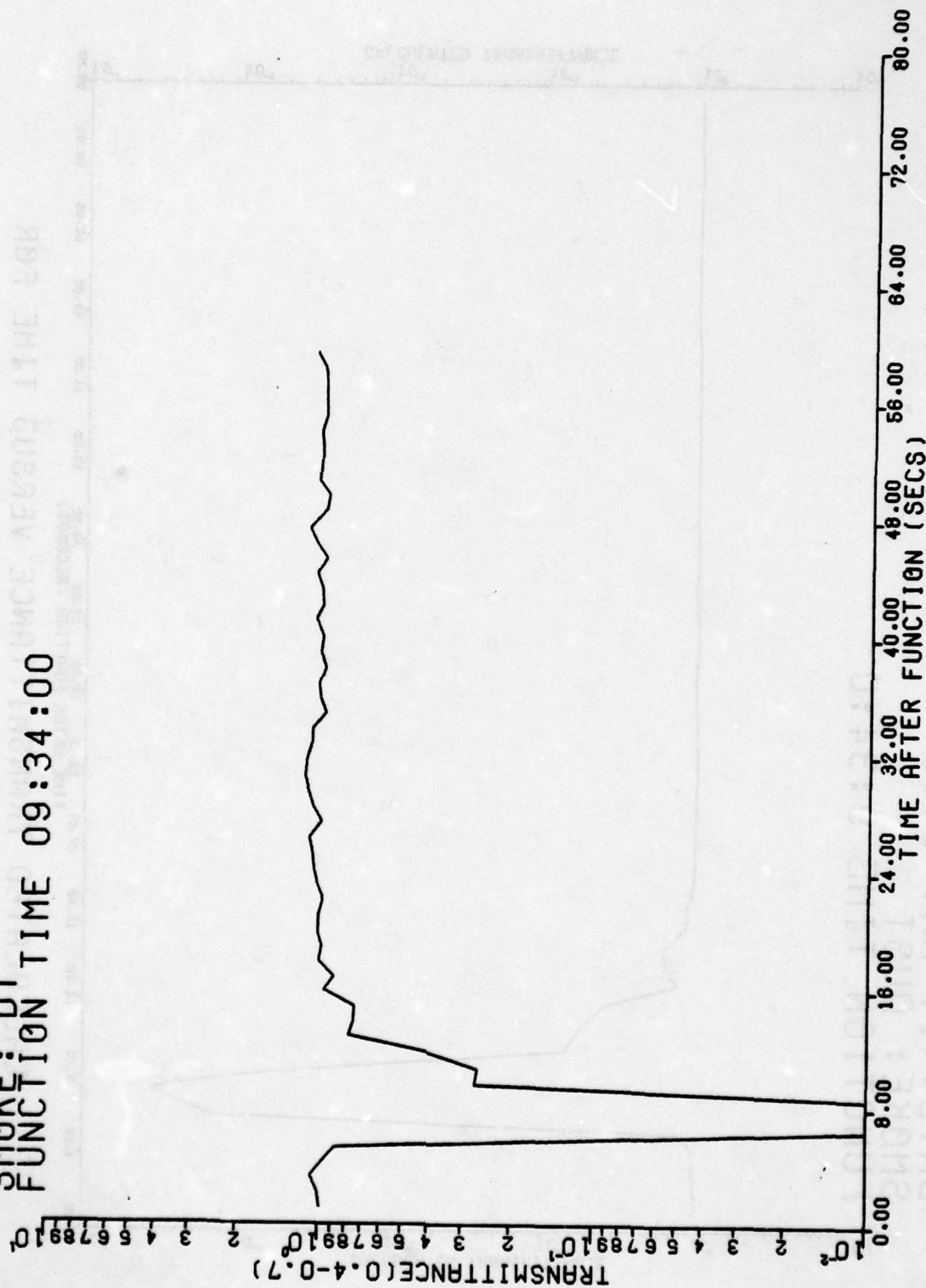
CLOUD LUMINANCE VERSUS TIME FOR  
 WAVELENGTH 1.060 (μm)

TRIAL #14 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:34:0



B-17-7

TRIAL 14; FT. SILL TESTS  
 DATE: 17 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 09:34:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7  $\mu\text{m}$

AD-A066 377

ARMY DUGWAY PROVING GROUND UTAH F/G 19/4  
DUST/DEBRIS TEST CONDUCTED AT FORT SILL, OKLAHOMA BY DUGWAY PRO--ETC(U)  
SEP 78

**F/G 19/4**

UNCLASSIFIED

DPG-FR-78-313-VOL-1

NL

3 OF 3

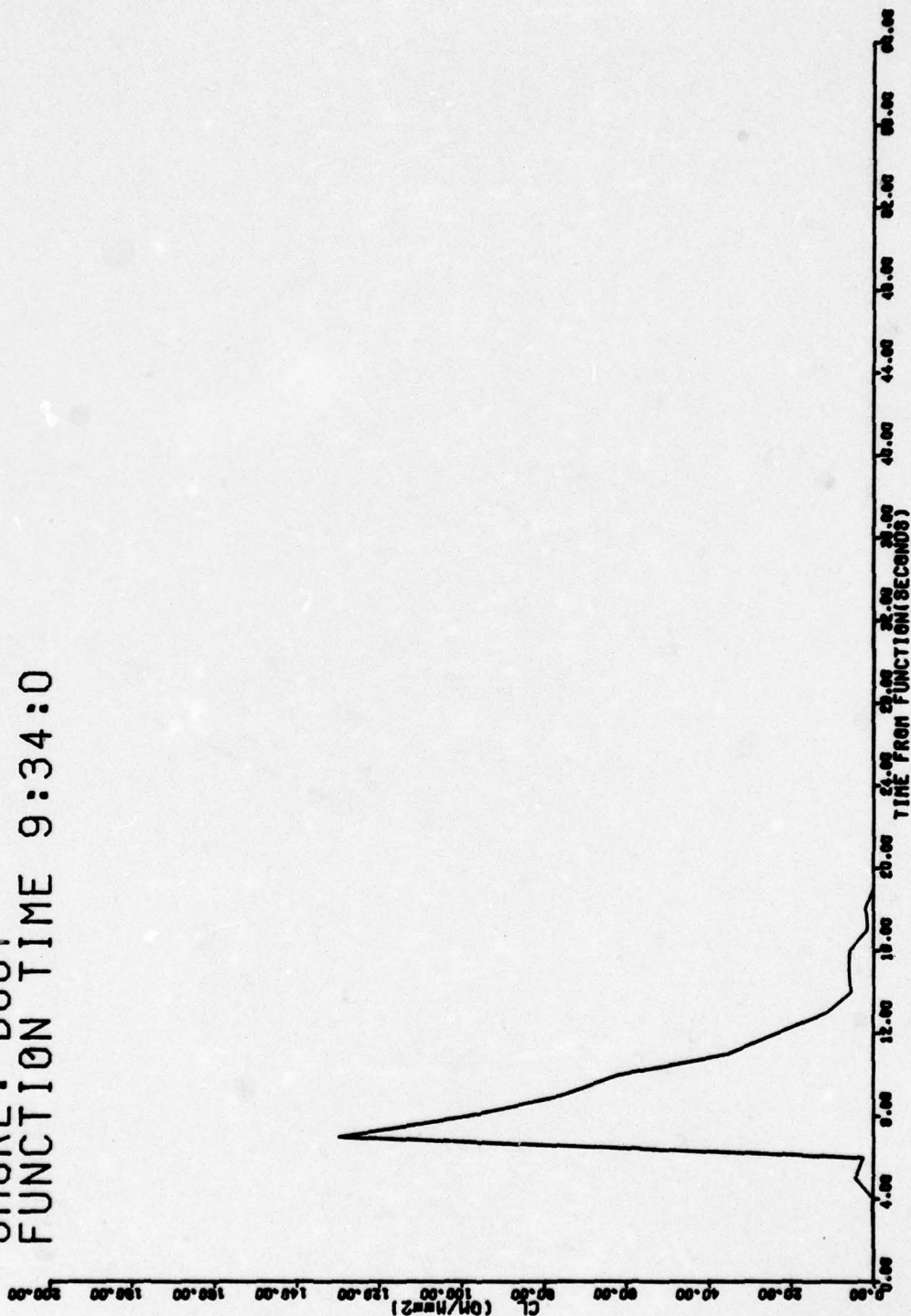
AD  
A066377

1000

END  
DATE  
FILMED

5-79  
DDC

TRIAL #14 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:34:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 18

CONTENTS

TRIAL DPI-005-T15 (DUST) 17 MAY 1978

PAGE

B-18-2

TABLE OF TEST DAY DATA

B-18-3

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
9.750  $\mu\text{m}$

B-18-4

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
3.443  $\mu\text{m}$

B-18-5

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-18-6

FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-18-7

FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7  $\mu\text{m}$

B-18-8

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
BETWEEN 0.4 AND 0.7  $\mu\text{m}$

B-18-9

FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T15

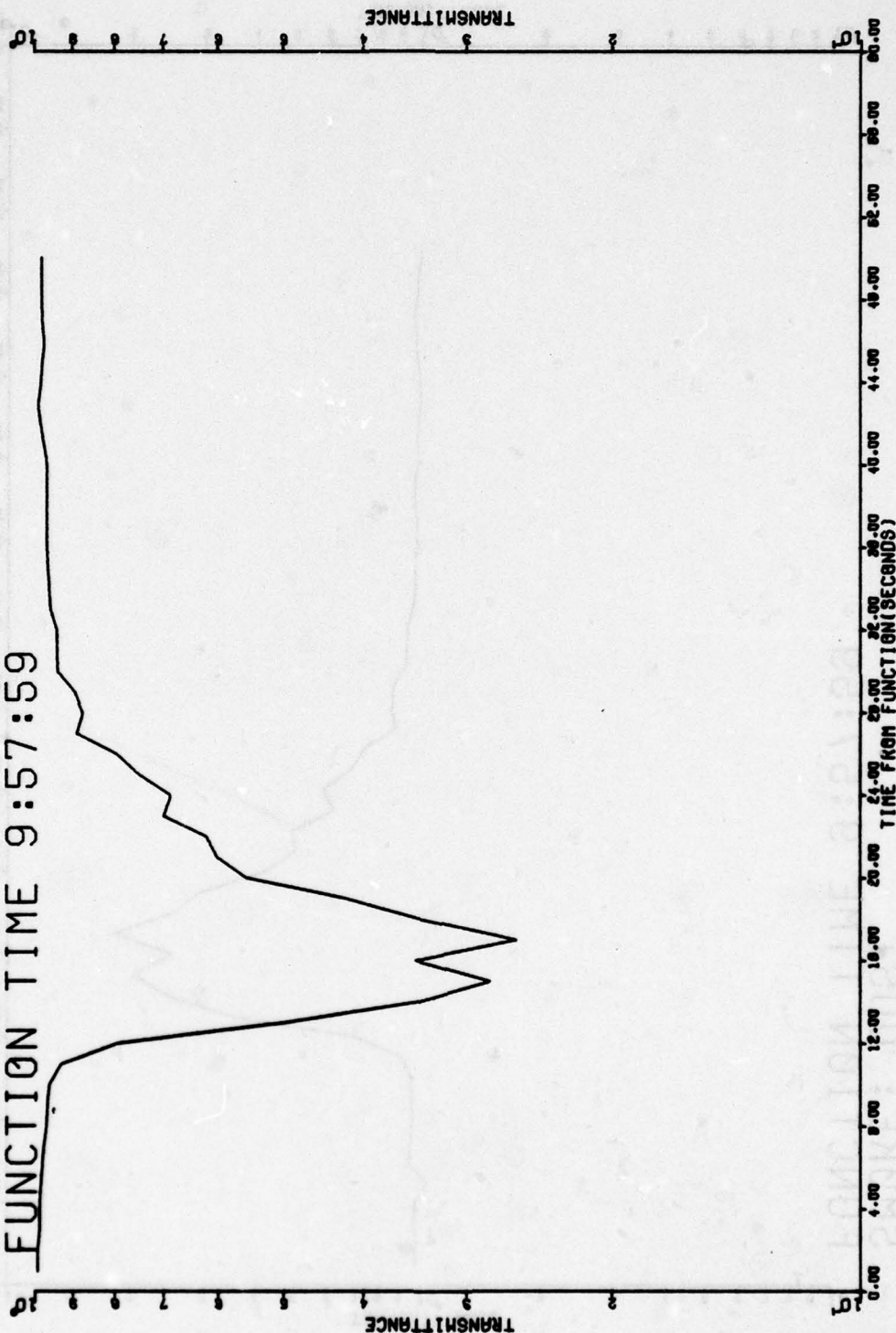
DATE: 17 May 1978

TIME: 0957

Wind Direction, degrees (2 meter) . . . . .	114
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	7.3
Relative Humidity, percent (2 meter) . . . . .	82
Temperature . . . . .	62°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	NR
Range (meter) . . . . .	NR
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.59
1.3 - 2.3 . . . . .	0.40
2.3 - 10.0 . . . . .	0.00
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	< 1.3*

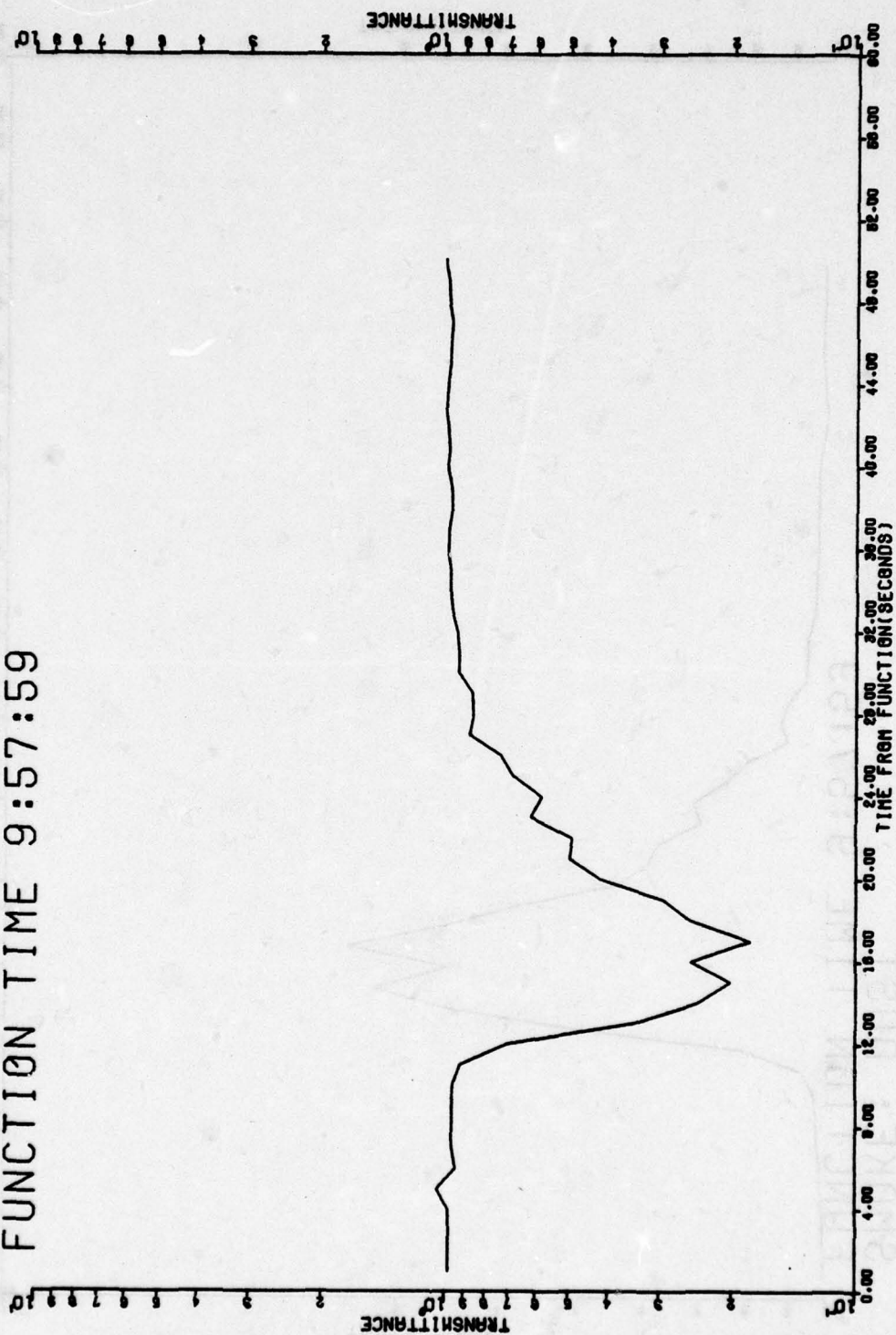
\*This figure represents an upper bound to the NMD, since it is not possible to compute an NMD with probit analysis or to obtain a graphical estimate.

TRIAL #15 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:57:59



TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 (μm)

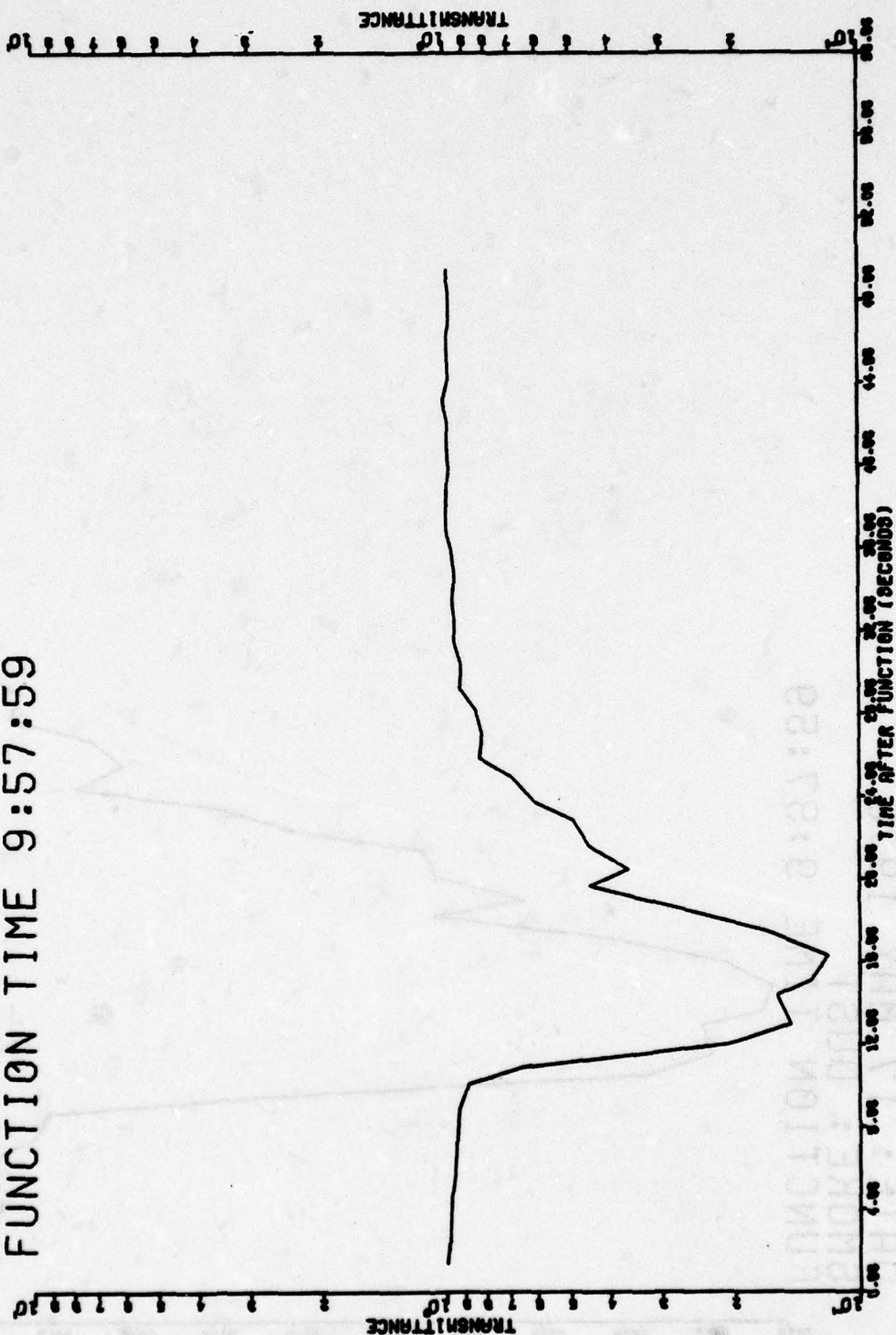
TRIAL #15 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:57:59



TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 (um)

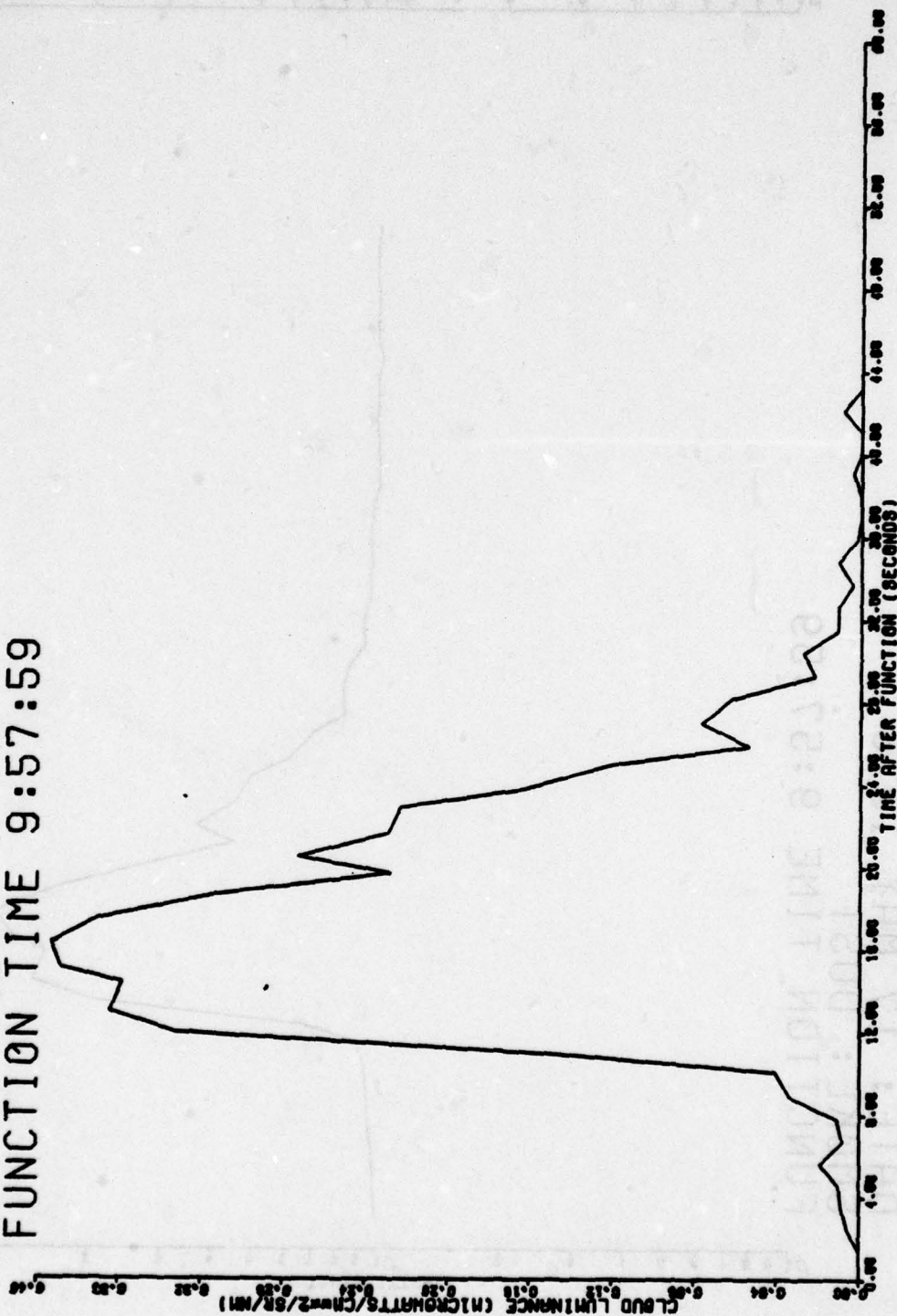
B-18-4

TRIAL #15 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:57:59



TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

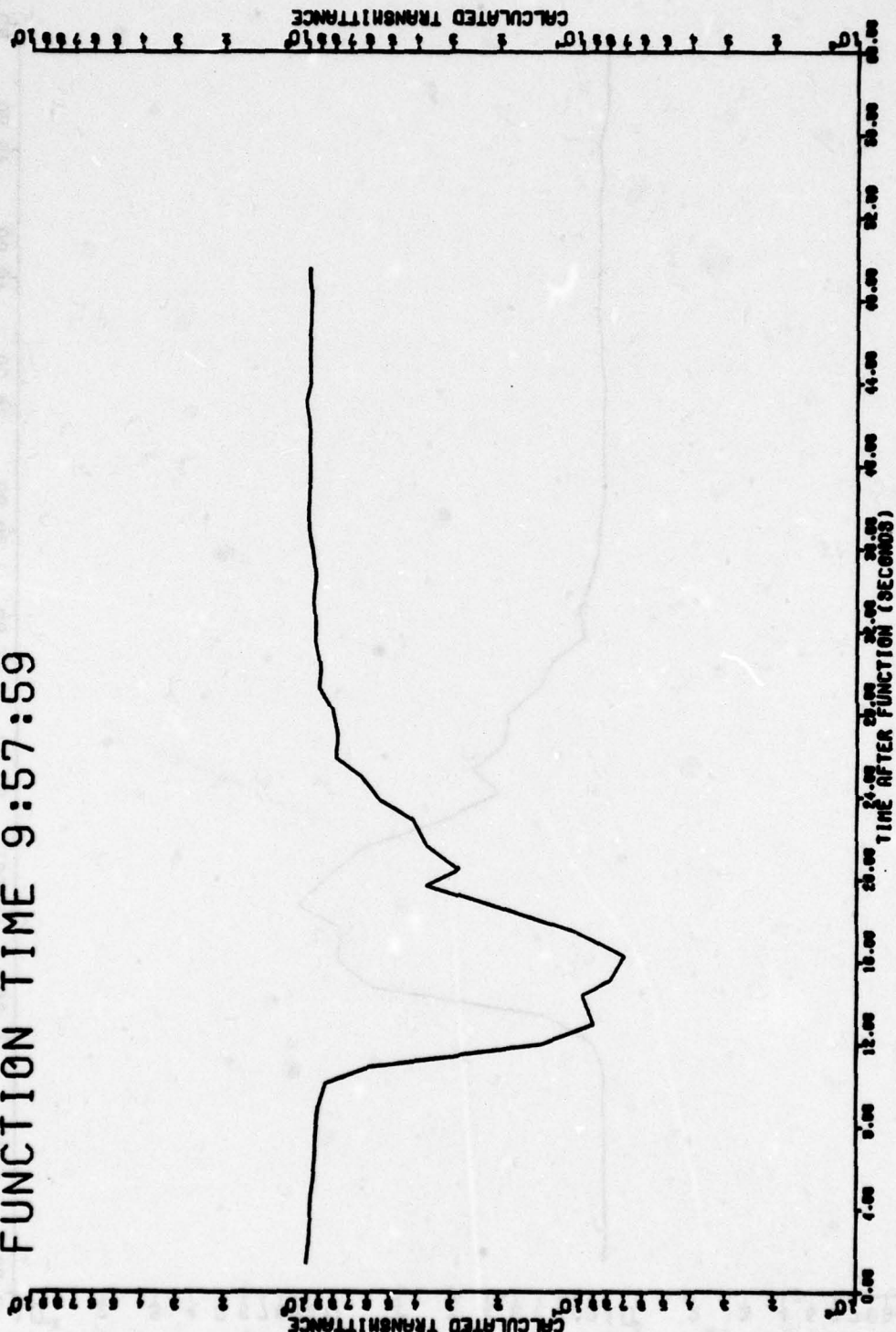
TRIAL #15 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 9:57:59



CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

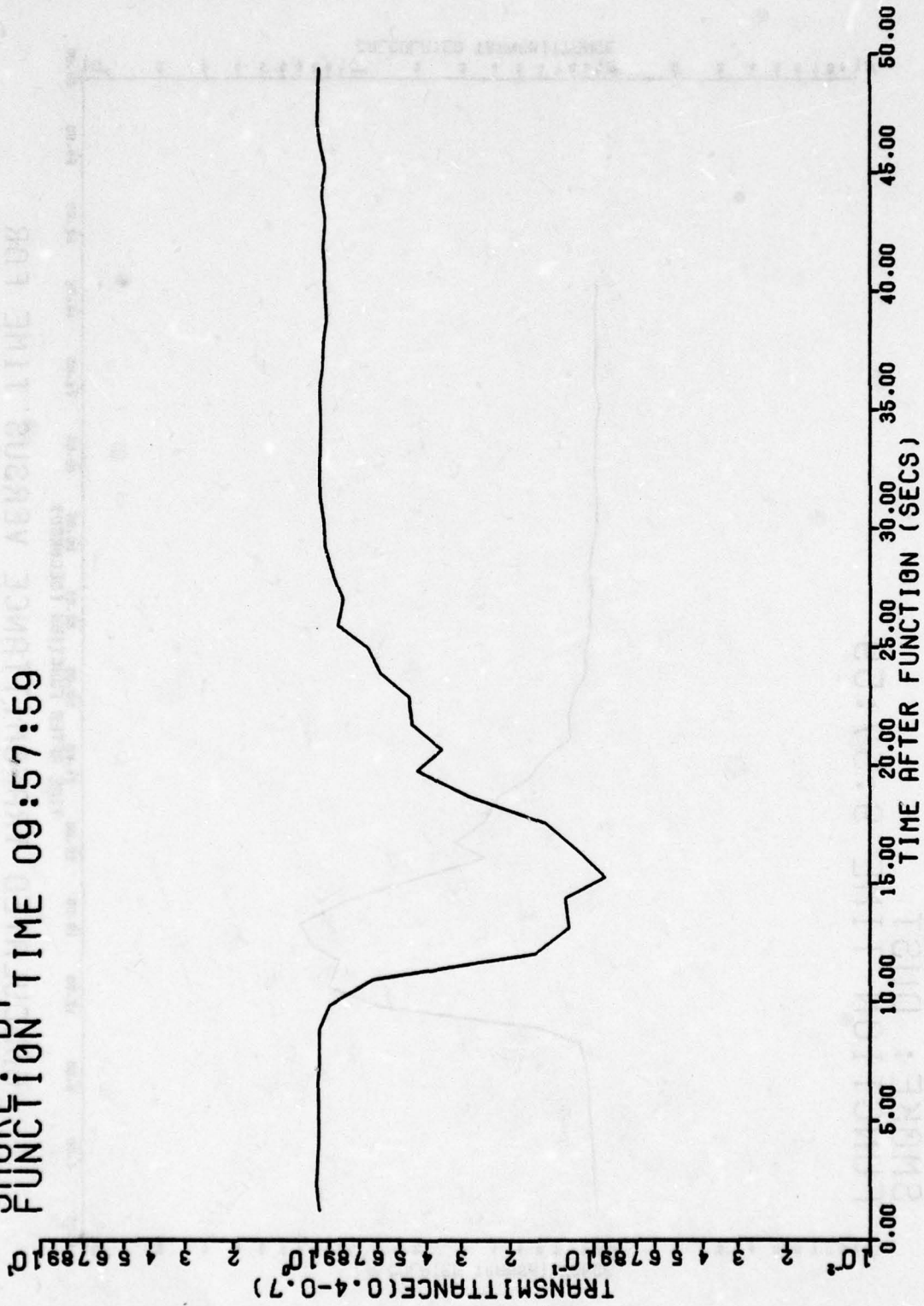
B-18-6

TRIAL #15 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:57:59



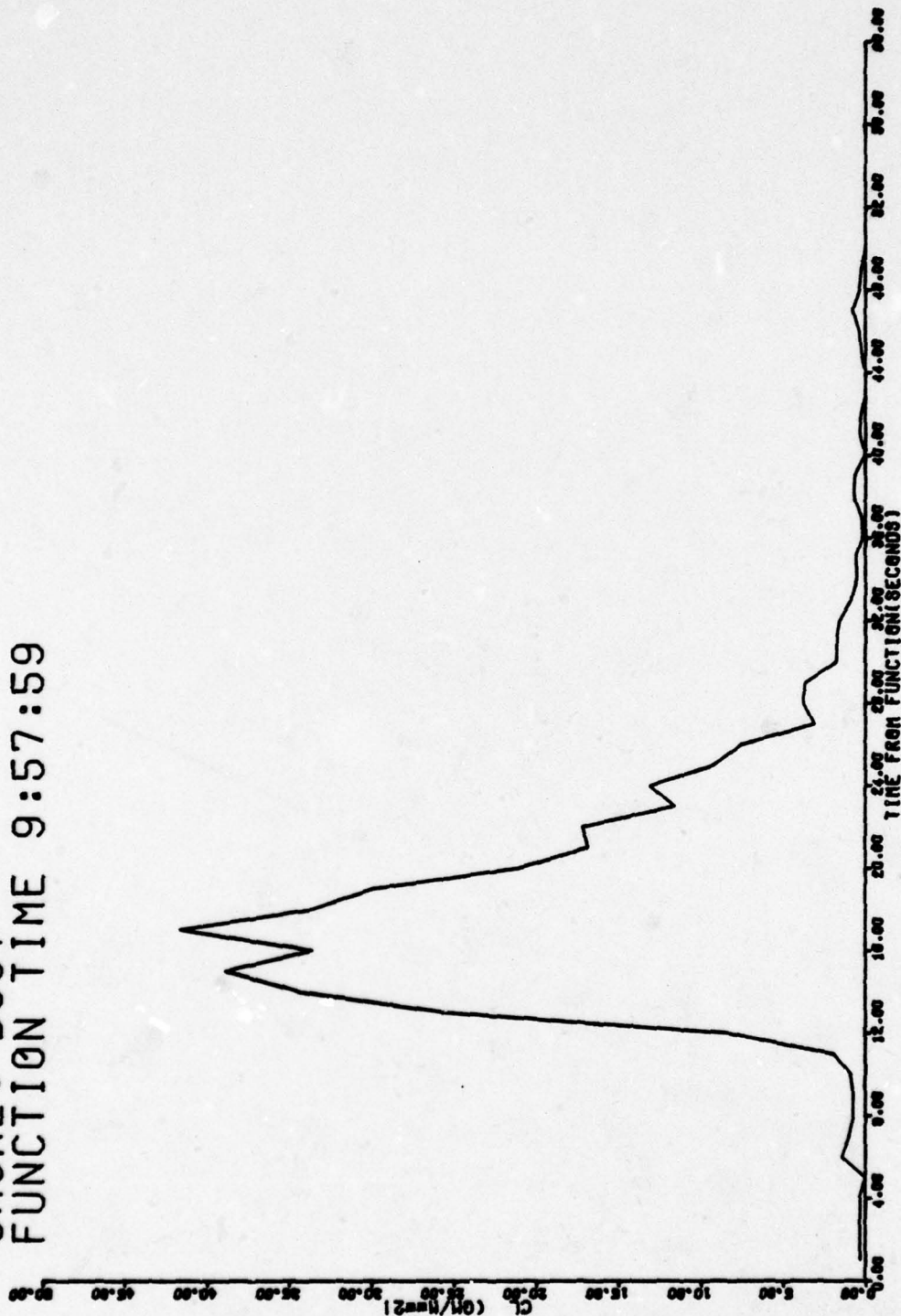
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
 WAVELENGTH 0.4-0.7 (μm)

TRIAL 15, FT. SILL TESTS  
DATE: 17 MAY 1978  
SMOKE: DT  
FUNCTION TIME 09:57:59



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #15 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 9:57:59



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 19

CONTENTS

TRIAL DPI-005-T16 (DUST) 17 MAY 1978

<u>PAGE</u>	
B-19-2	TABLE OF TEST DAY DATA
B-19-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-19-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-19-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-19-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-19-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-19-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-19-9	FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T16

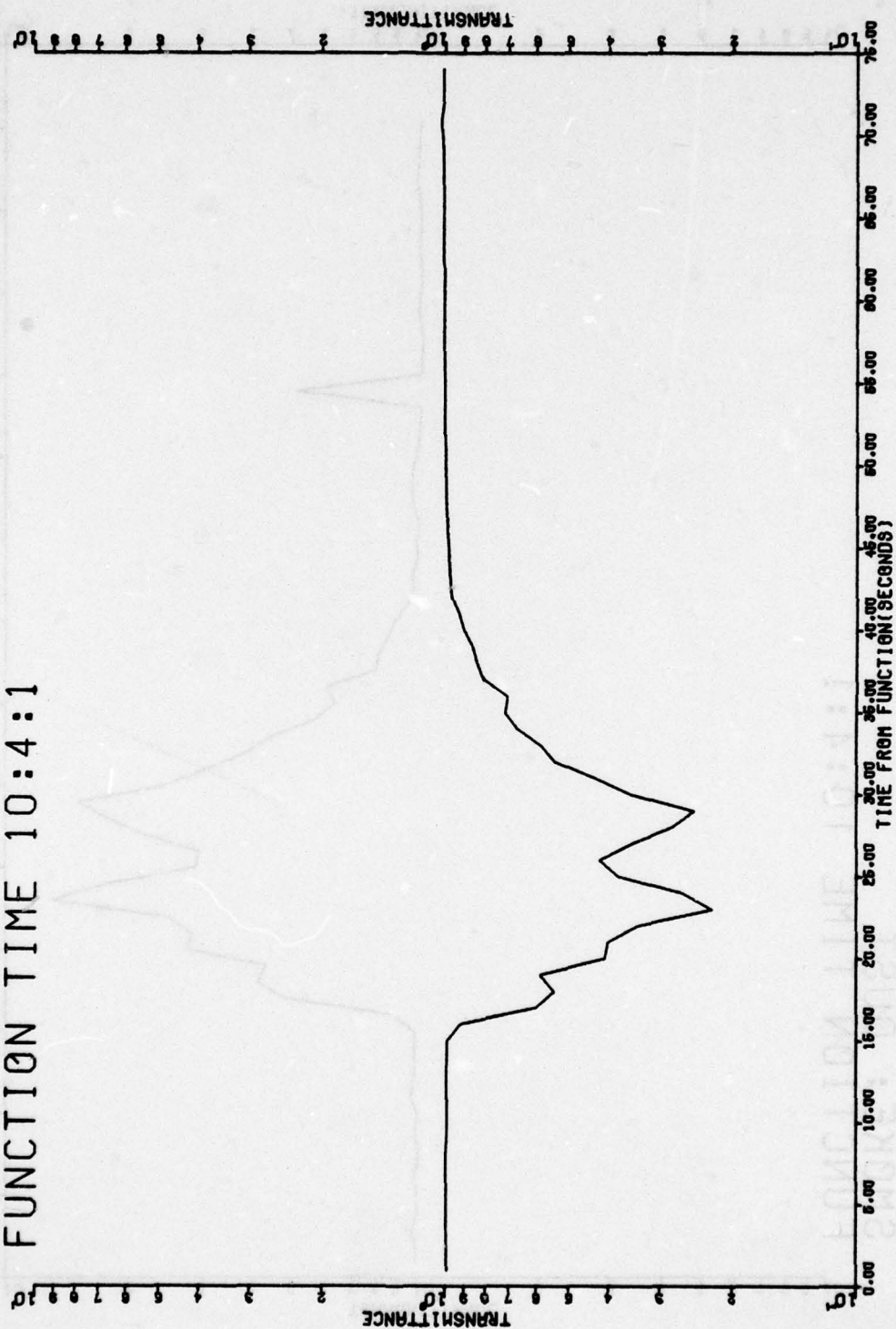
DATE: 17 May 1978

TIME: 1004

Wind Direction, degrees (2 meter) . . . . .	122
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.6
Relative Humidity, percent (2 meter) . . . . .	91
Temperature . . . . .	61°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	091
Range (meter) . . . . .	141
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.61
1.3 - 2.3 . . . . .	0.38
2.3 - 10.0 . . . . .	0.00
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	< 1.3*

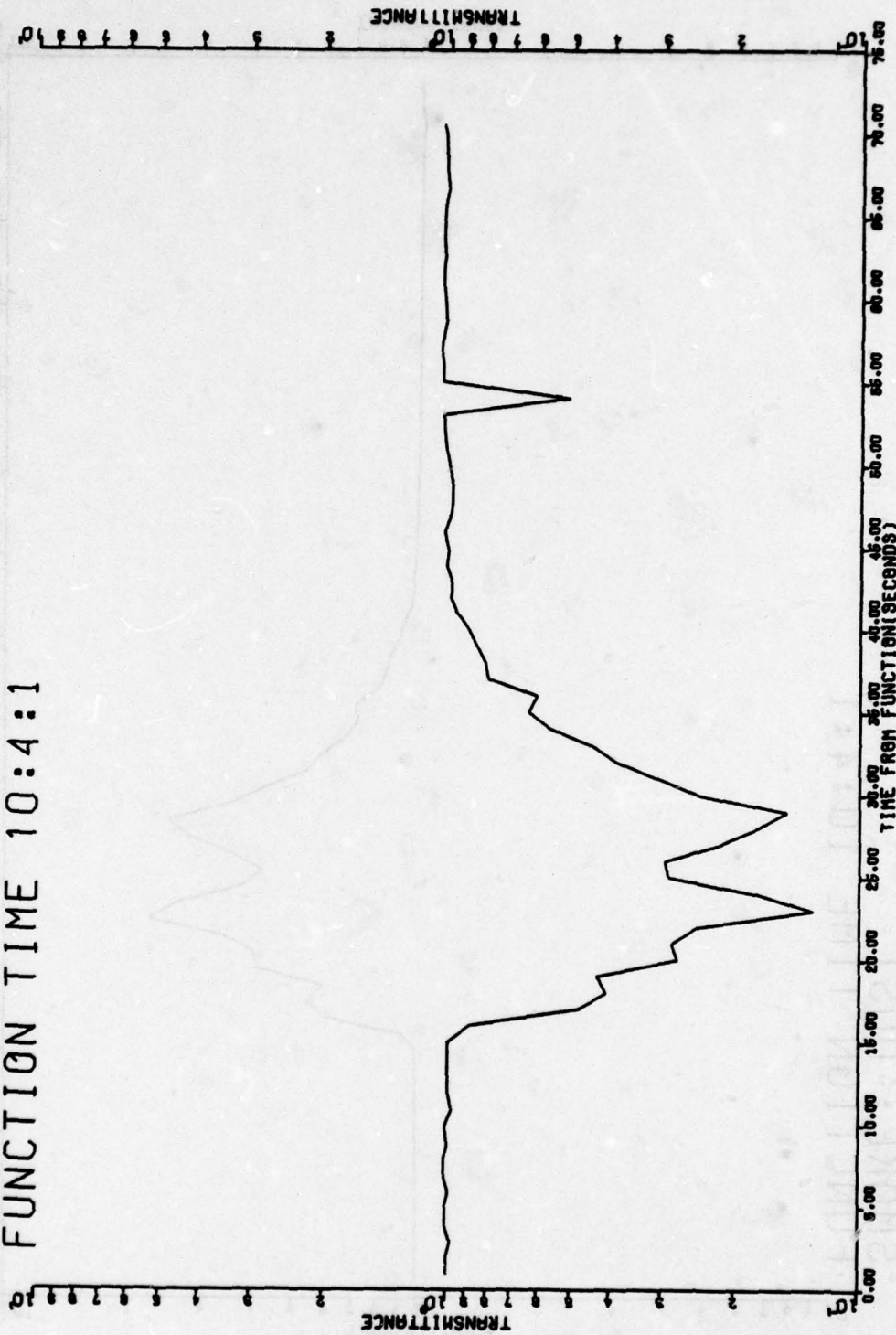
\*This figure represents an upper bound to the NMD, since it is not possible to compute an NMD with probit analysis or to obtain a graphical estimate.

TRIAL #16 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:4:1



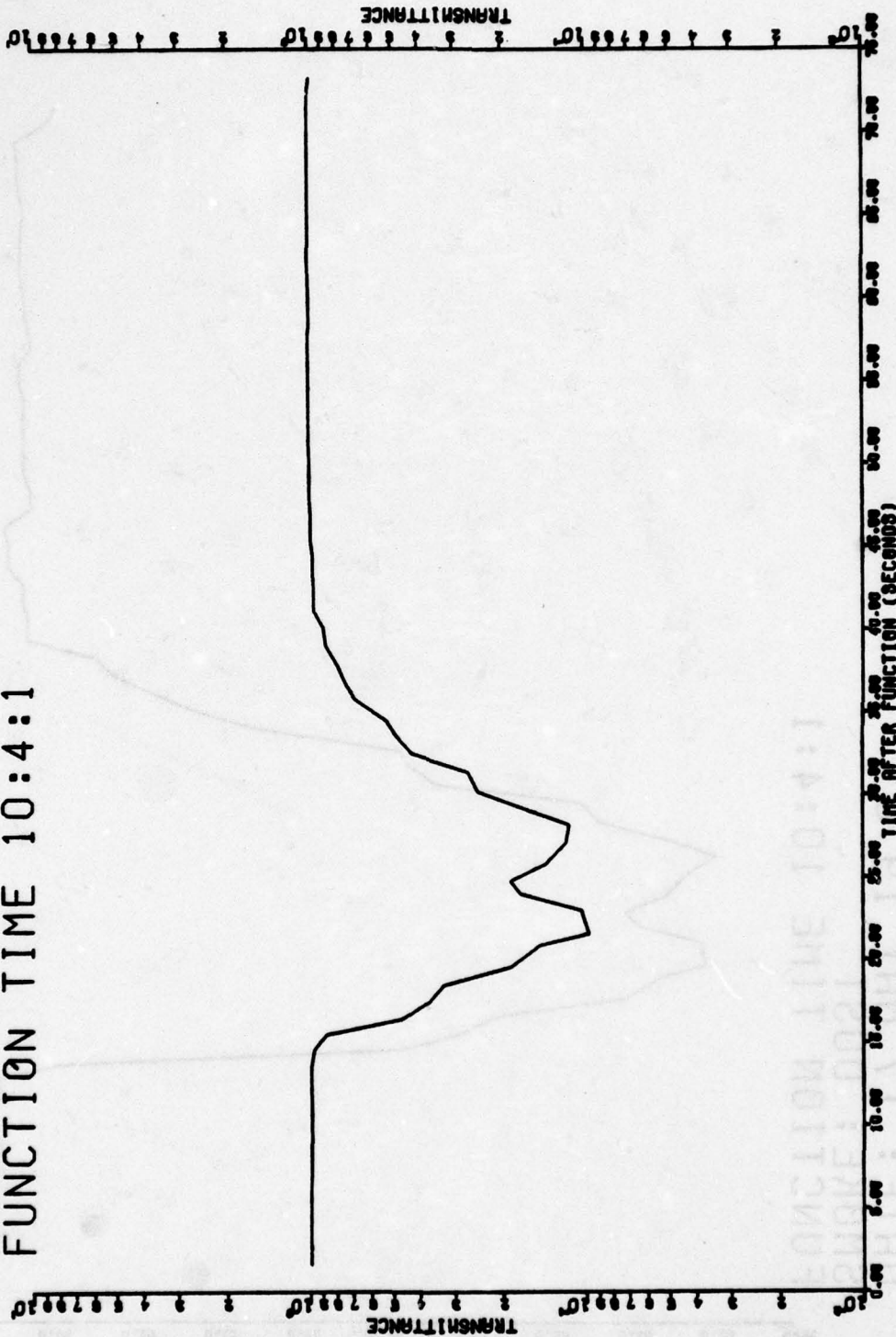
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #16 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:4:1



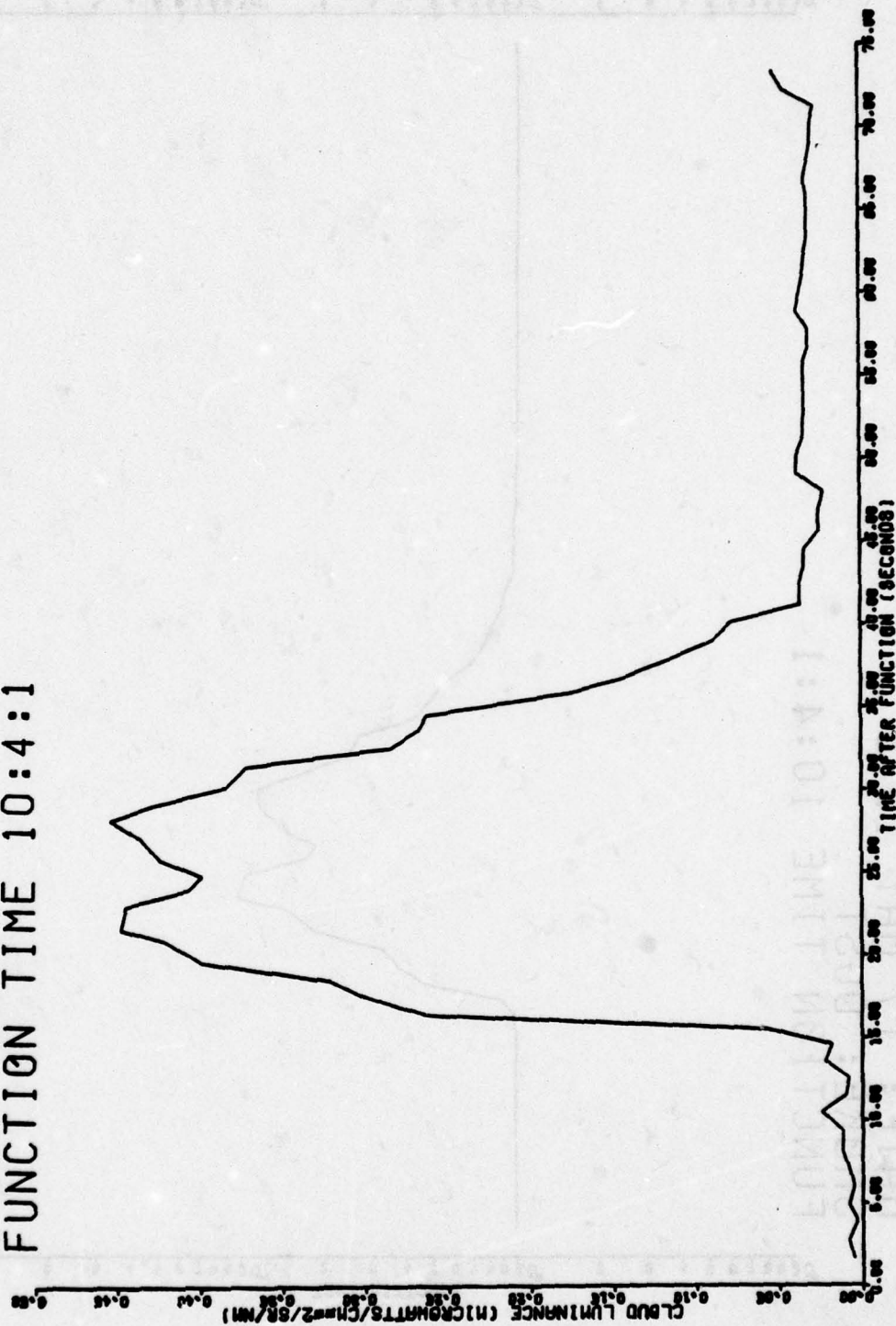
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #16 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:4:1



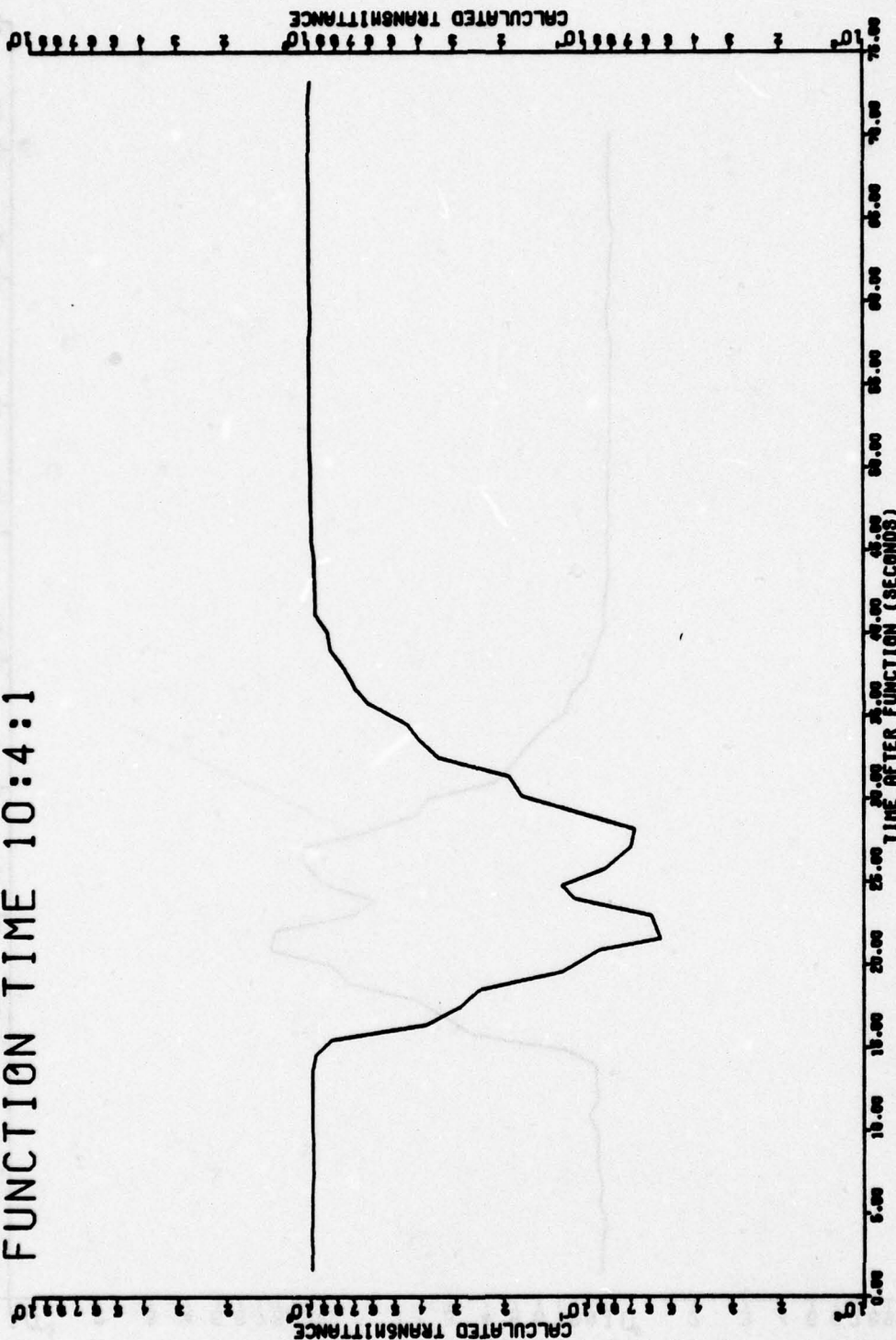
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #16 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:4:1



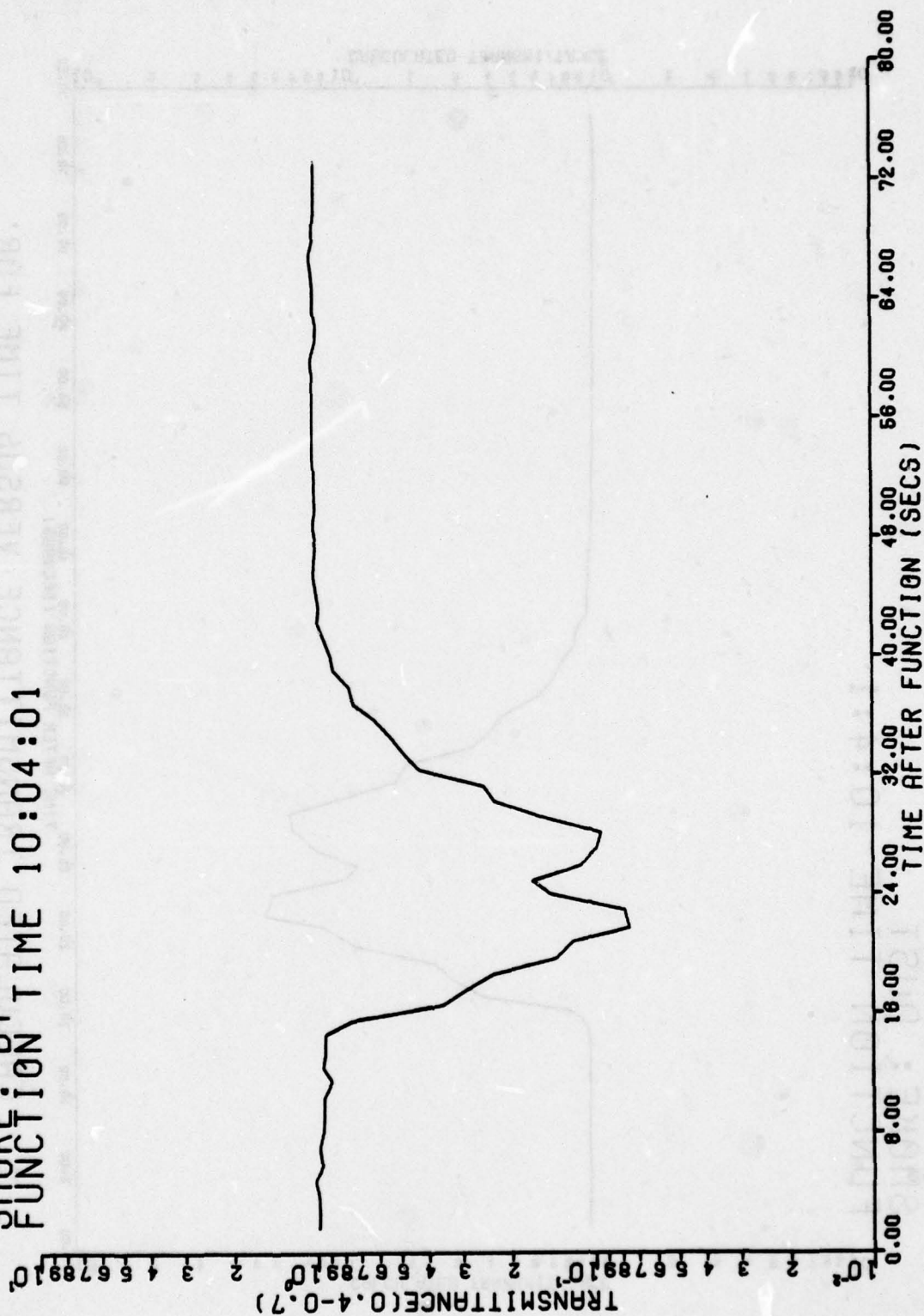
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #16 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:4:1



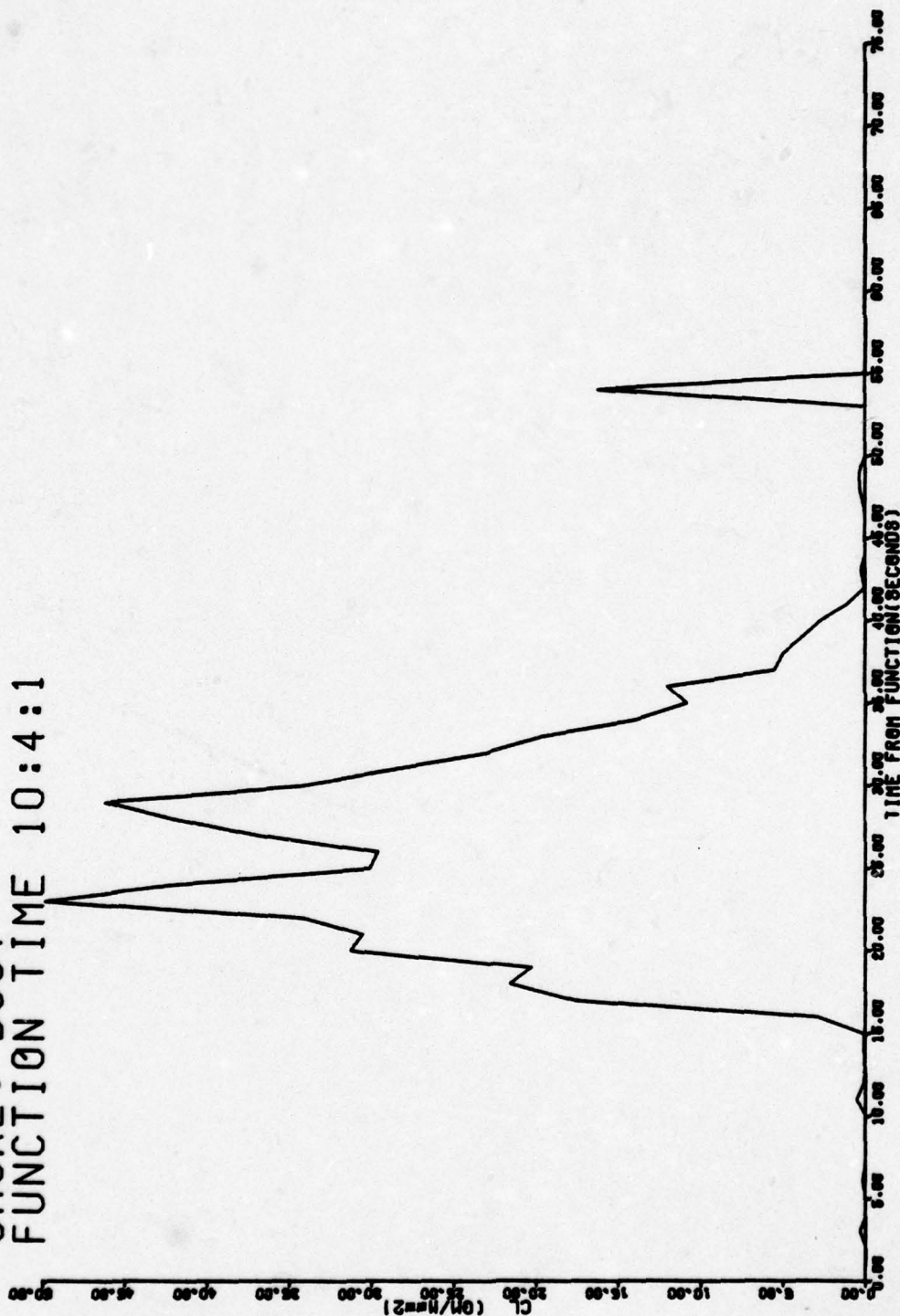
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 (um)

TRIAL 16; FT. SILL TESTS  
 DATE: 17 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 10:04:01



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #16 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 10:4:1



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 20

CONTENTS

TRIAL DPI-005-T17 (DUST) 17 MAY 1978

<u>PAGE</u>	
B-20-2	TABLE OF TEST DAY DATA
B-20-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-20-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-20-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-20-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-20-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-20-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-20-9	FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T17

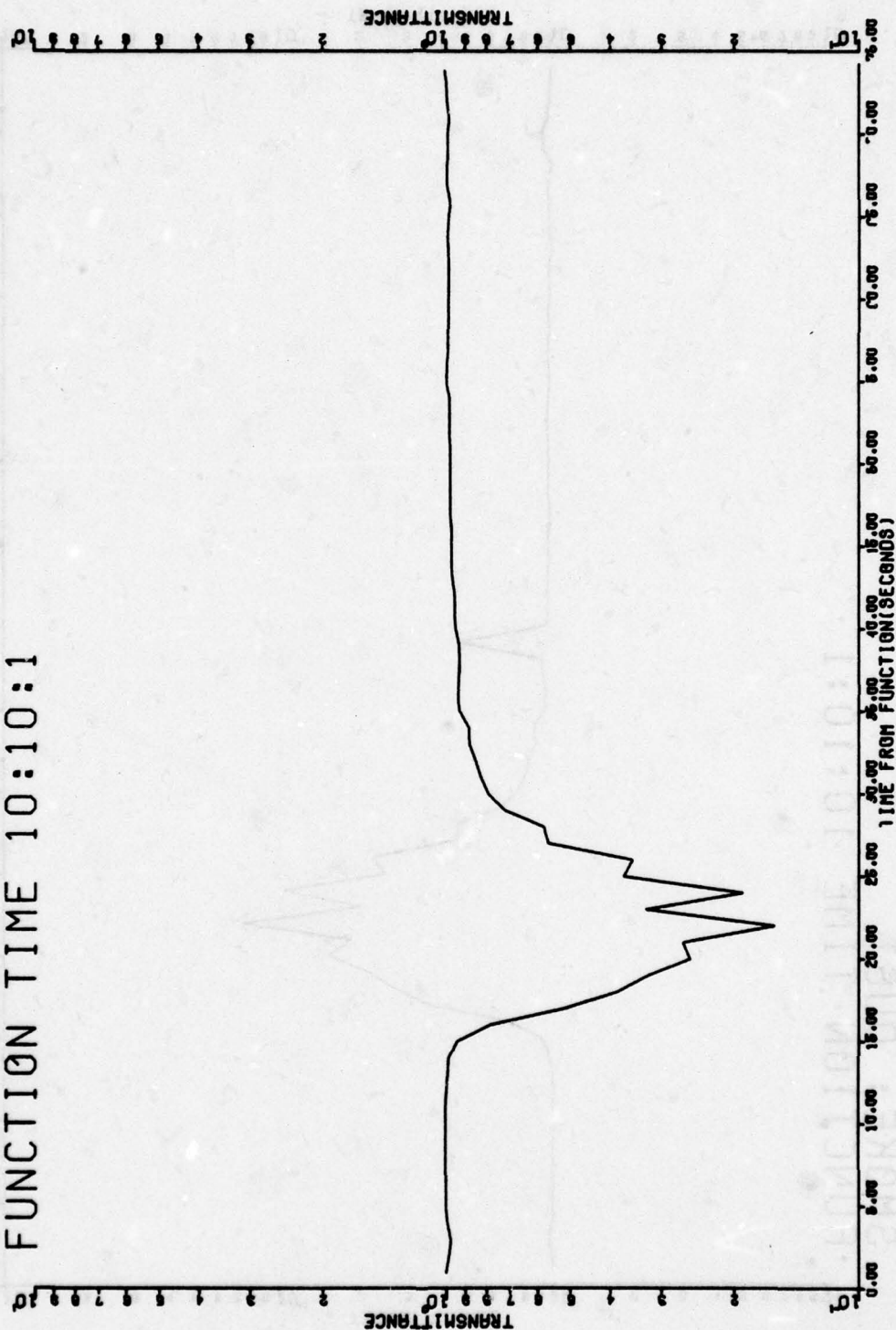
DATE: 17 May 1978

TIME: 1010

Wind Direction, degrees (2 meter) . . . . .	116
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.3
Relative Humidity, percent (2 meter) . . . . .	91
Temperature . . . . .	61°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	.M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	093
Range (meter) . . . . .	121
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.59
1.3 - 2.3 . . . . .	0.40
2.3 - 10.0 . . . . .	0.01
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	1.22*

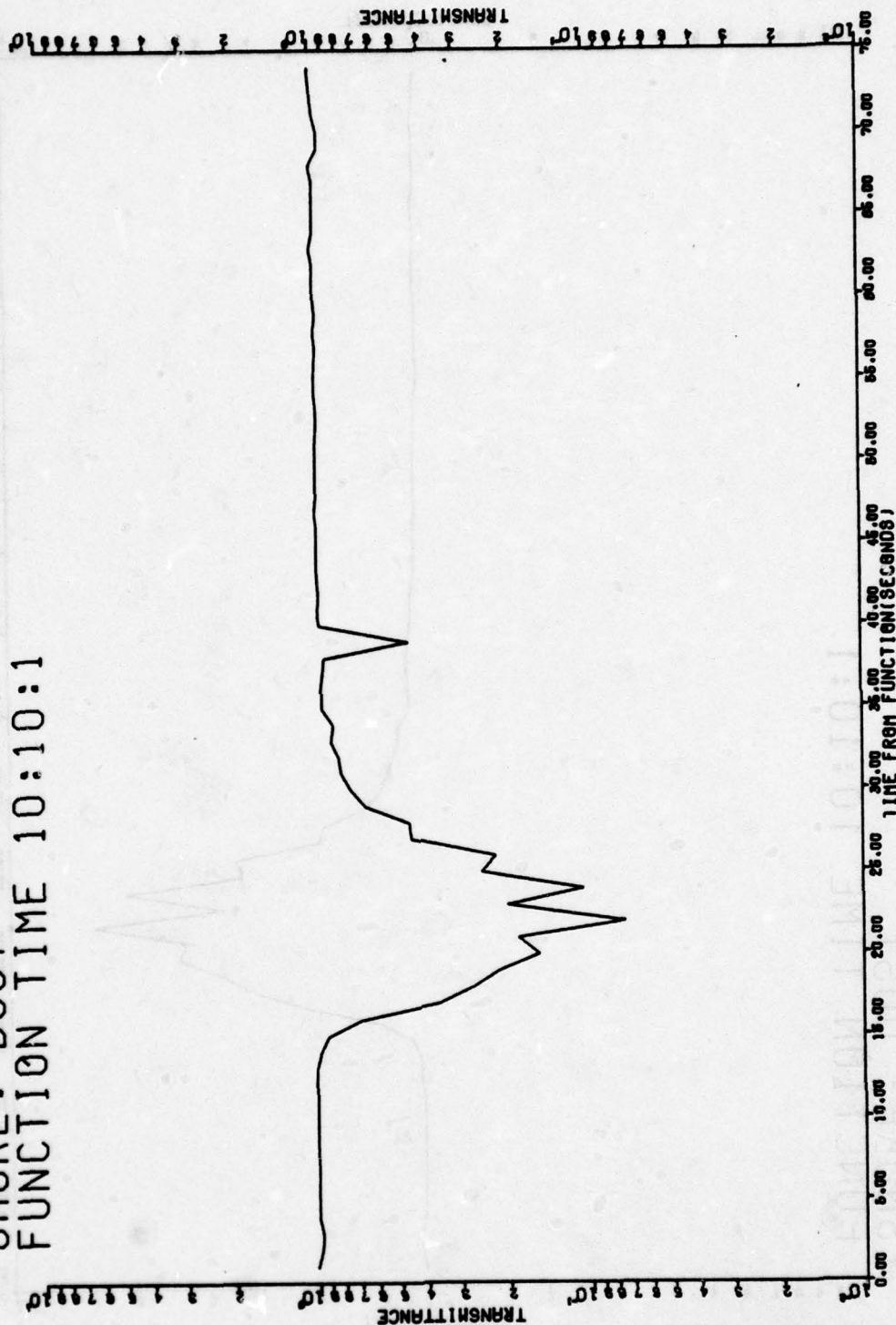
\*Graphical estimate provided

TRIAL #17 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:10:1



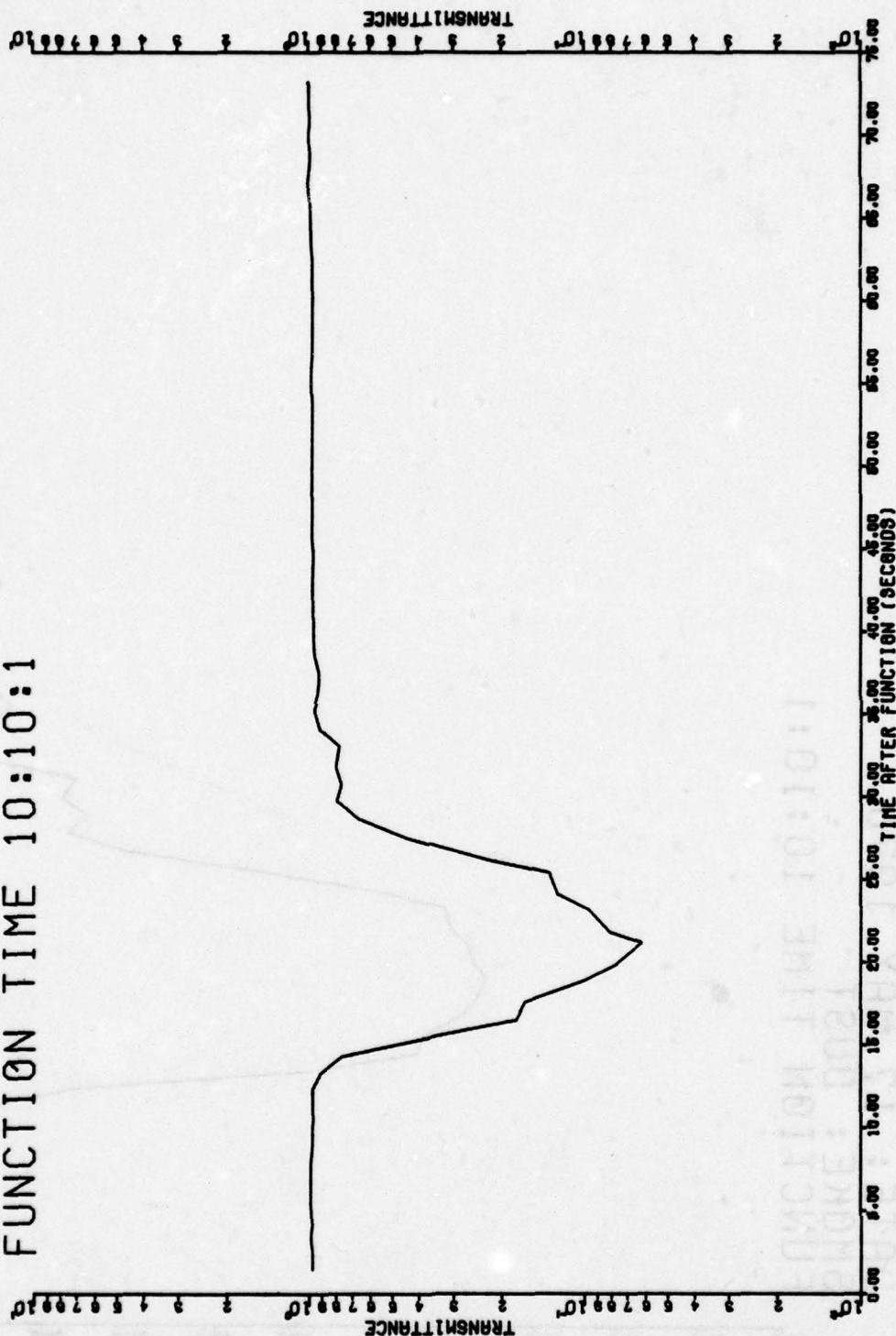
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #17 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:10:1



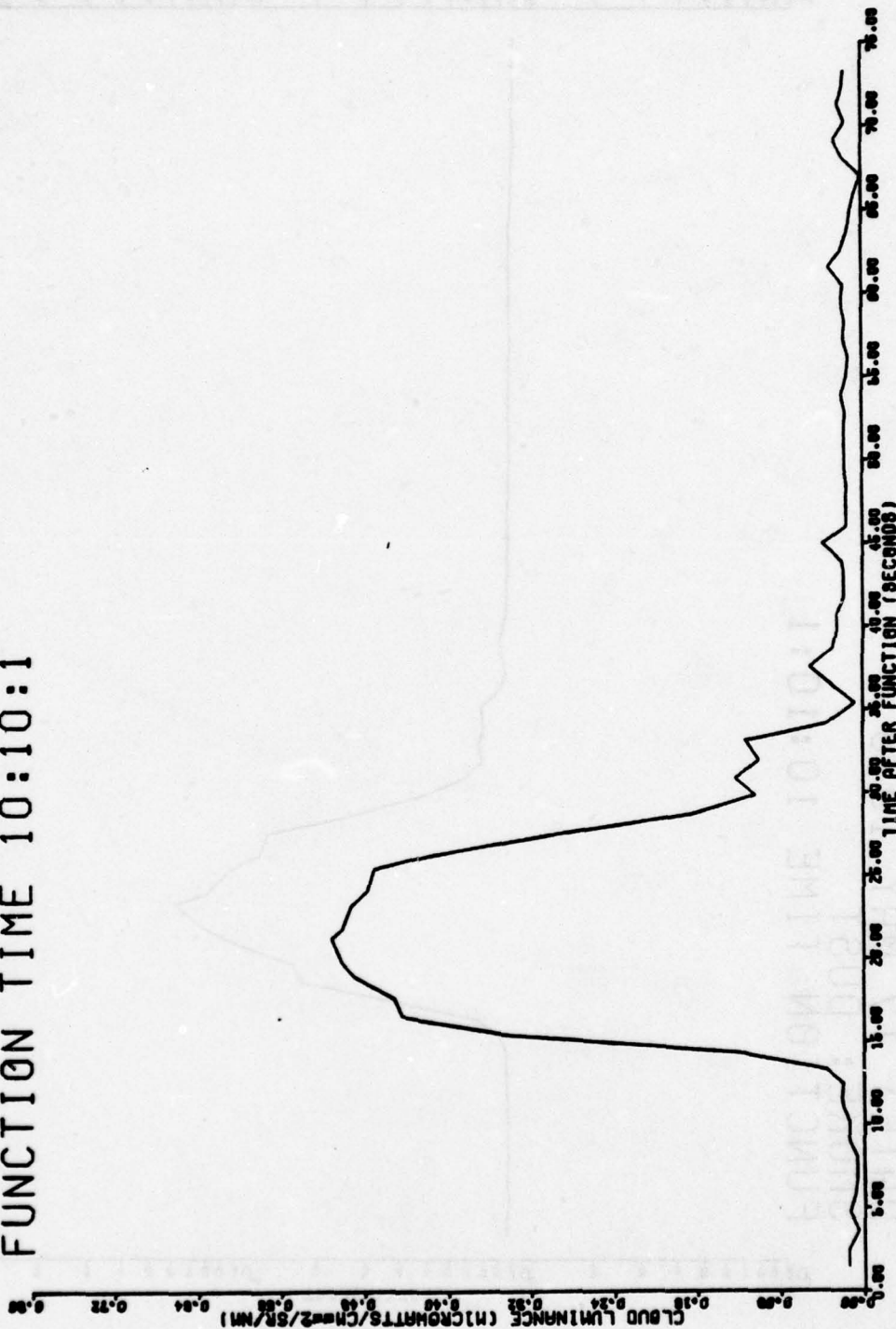
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #17 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:10:1



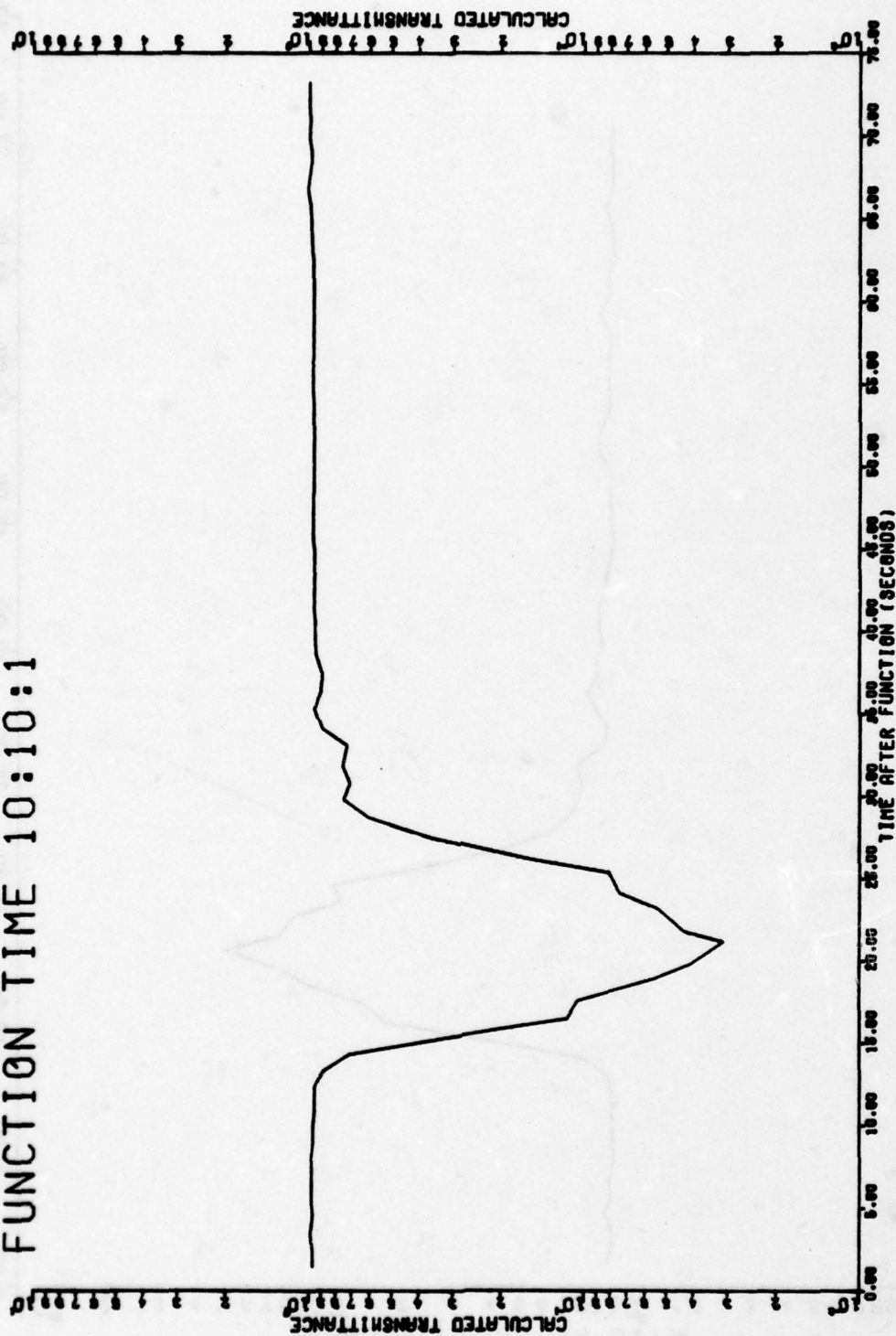
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #17 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:10:1



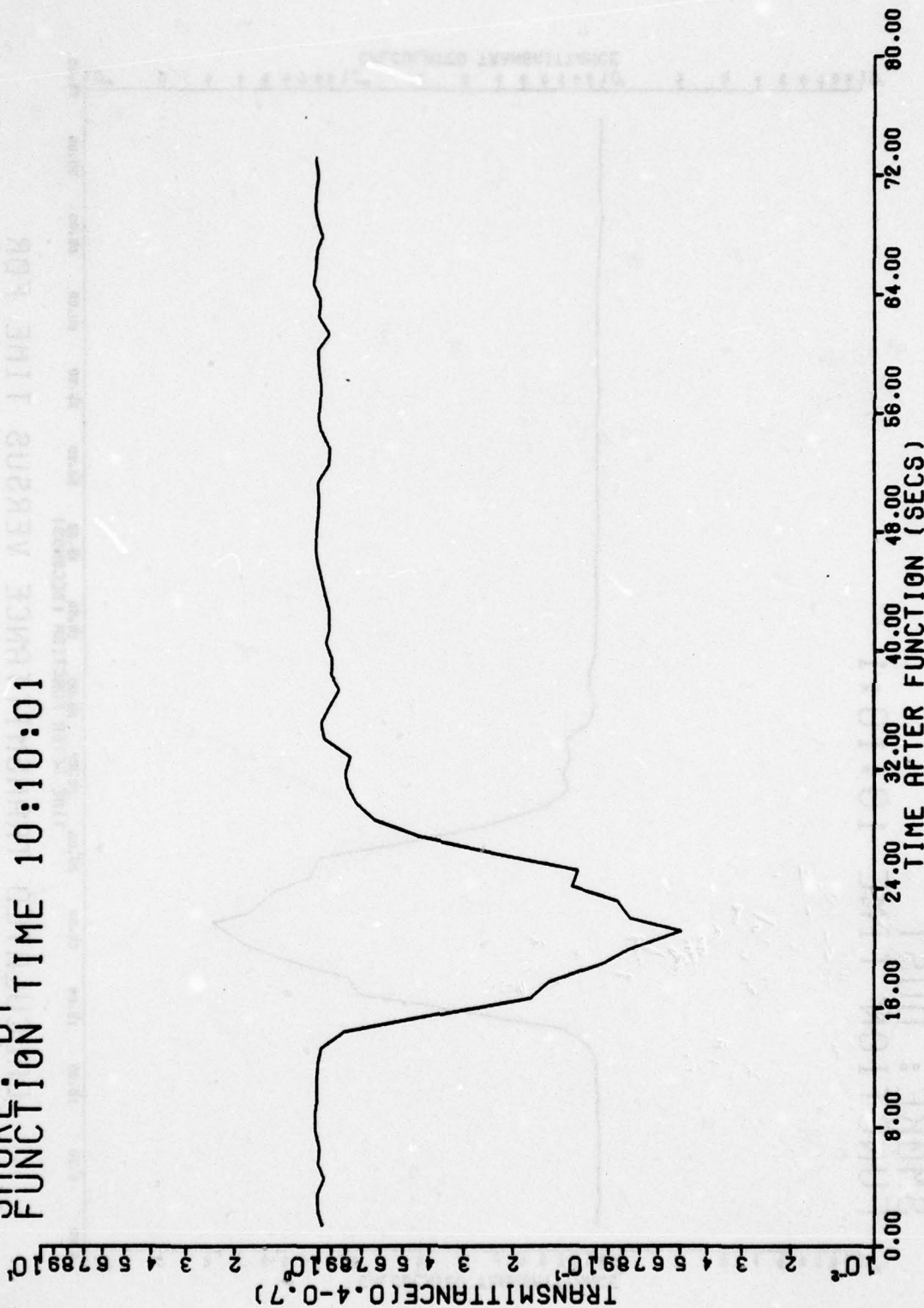
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (um)

TRIAL #17 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:10:1



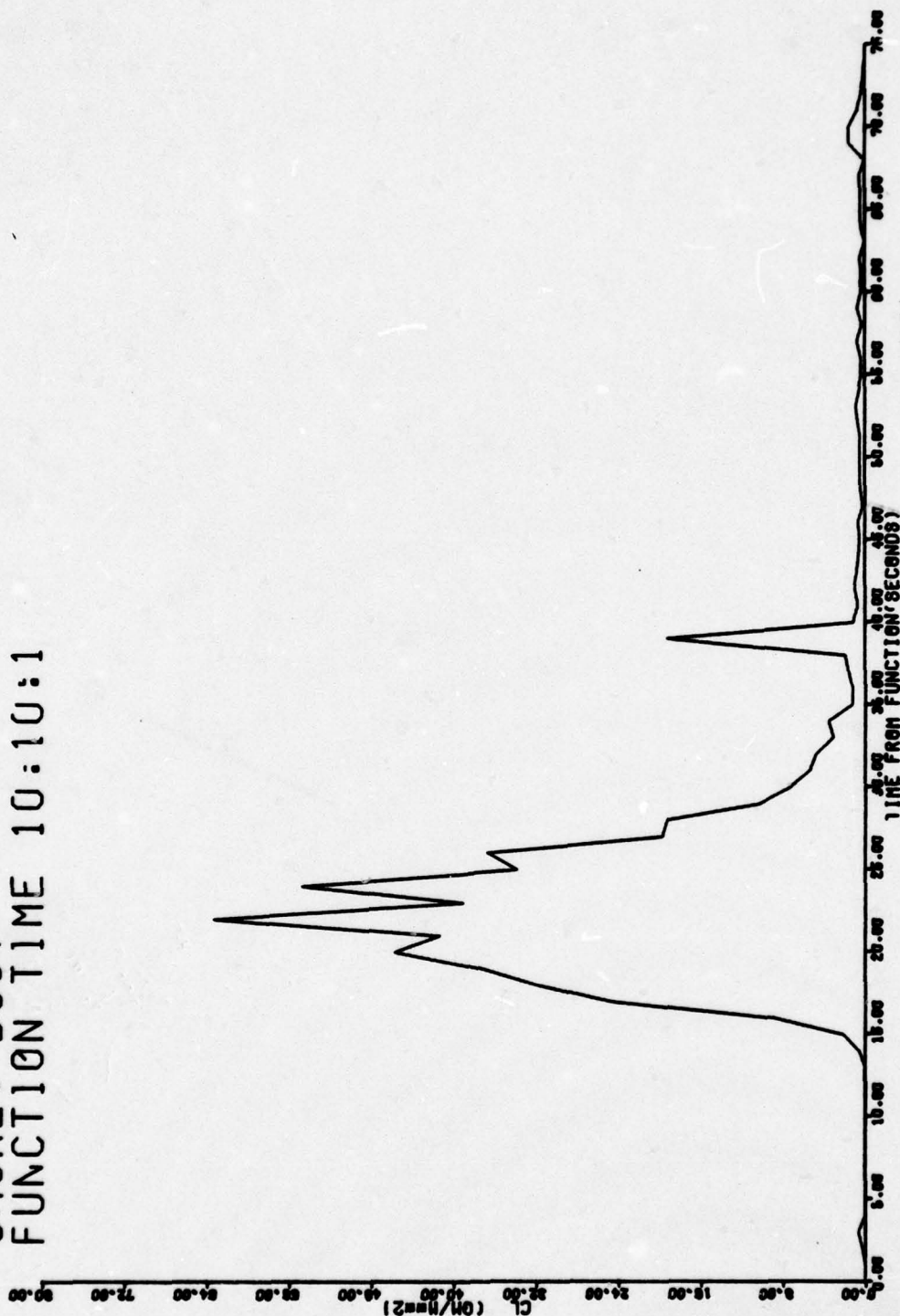
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 17; FT. SILL TESTS  
 DATE: 17 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 10:10:01



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 (μm)

TRIAL #17 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 10:10:1



CL VALUES VERSUS TIME  
CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 21

CONTENTS

TRIAL DPI-005-T18 (DUST) 17 MAY 1978

<u>PAGE</u>	
B-21-2	TABLE OF TEST DAY DATA
B-21-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-21-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-21-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-21-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-21-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-21-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-21-9	FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T18

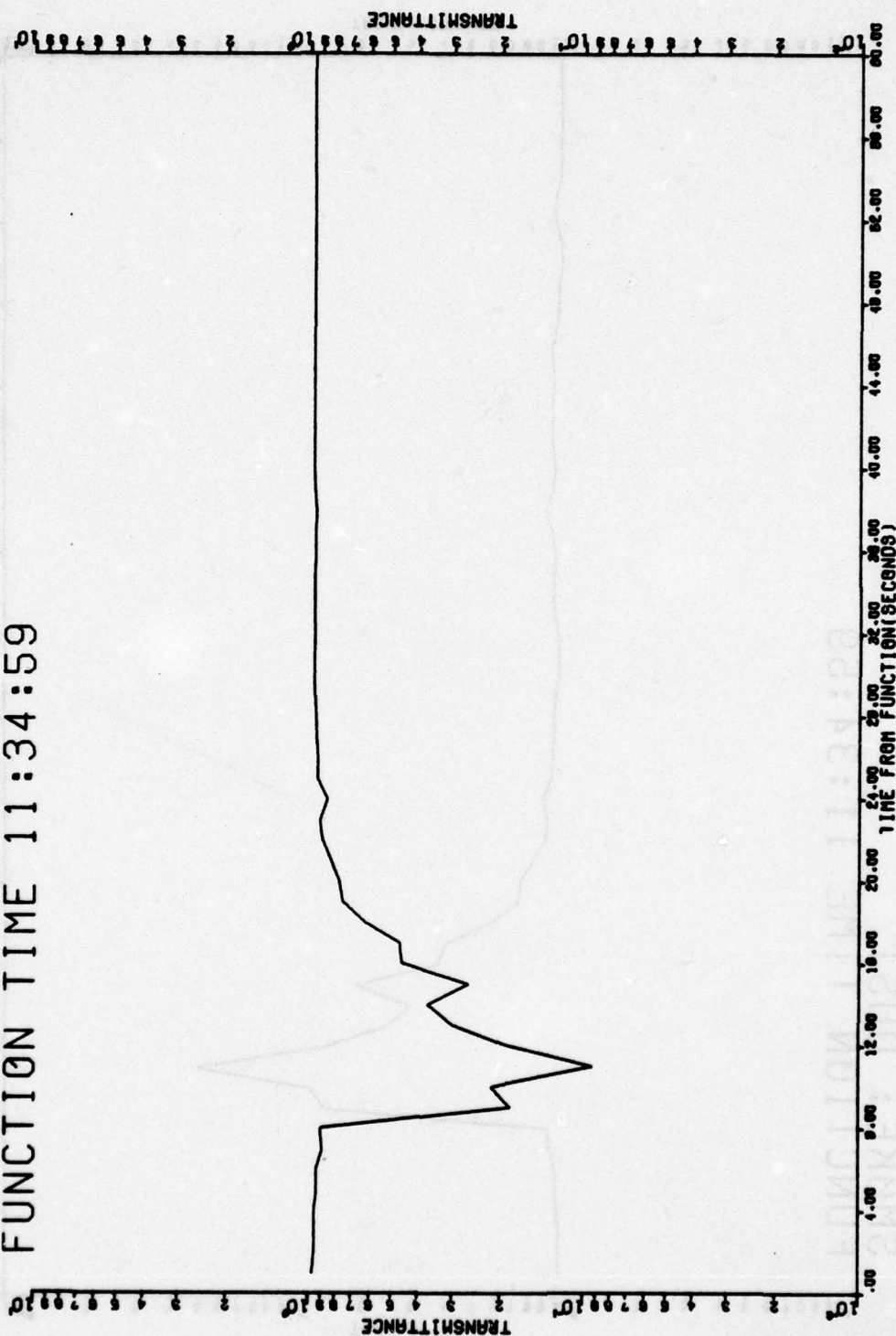
DATE: 17 May 1978

TIME: 1134

Wind Direction, degrees (2 meter) . . . . .	114
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	7.1
Relative Humidity, percent (2 meter) . . . . .	87
Temperature . . . . .	61°
Sky Conditions . . . . .	overcast
Type of Munition. . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	057
Range (meter) . . . . .	56

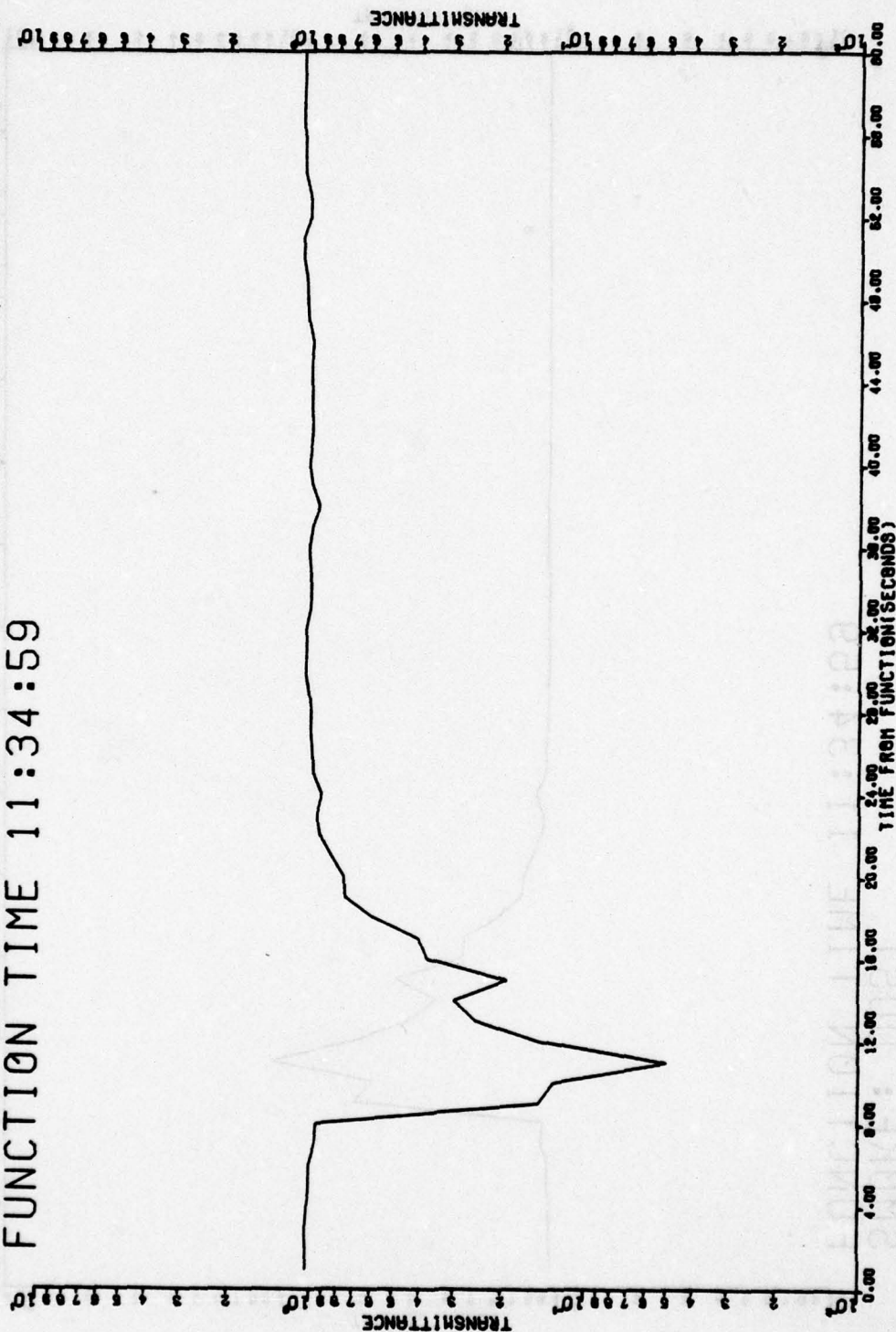
Particle size data are not available since the cloud did not encompass the PSA.

TRIAL #18 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:34:59



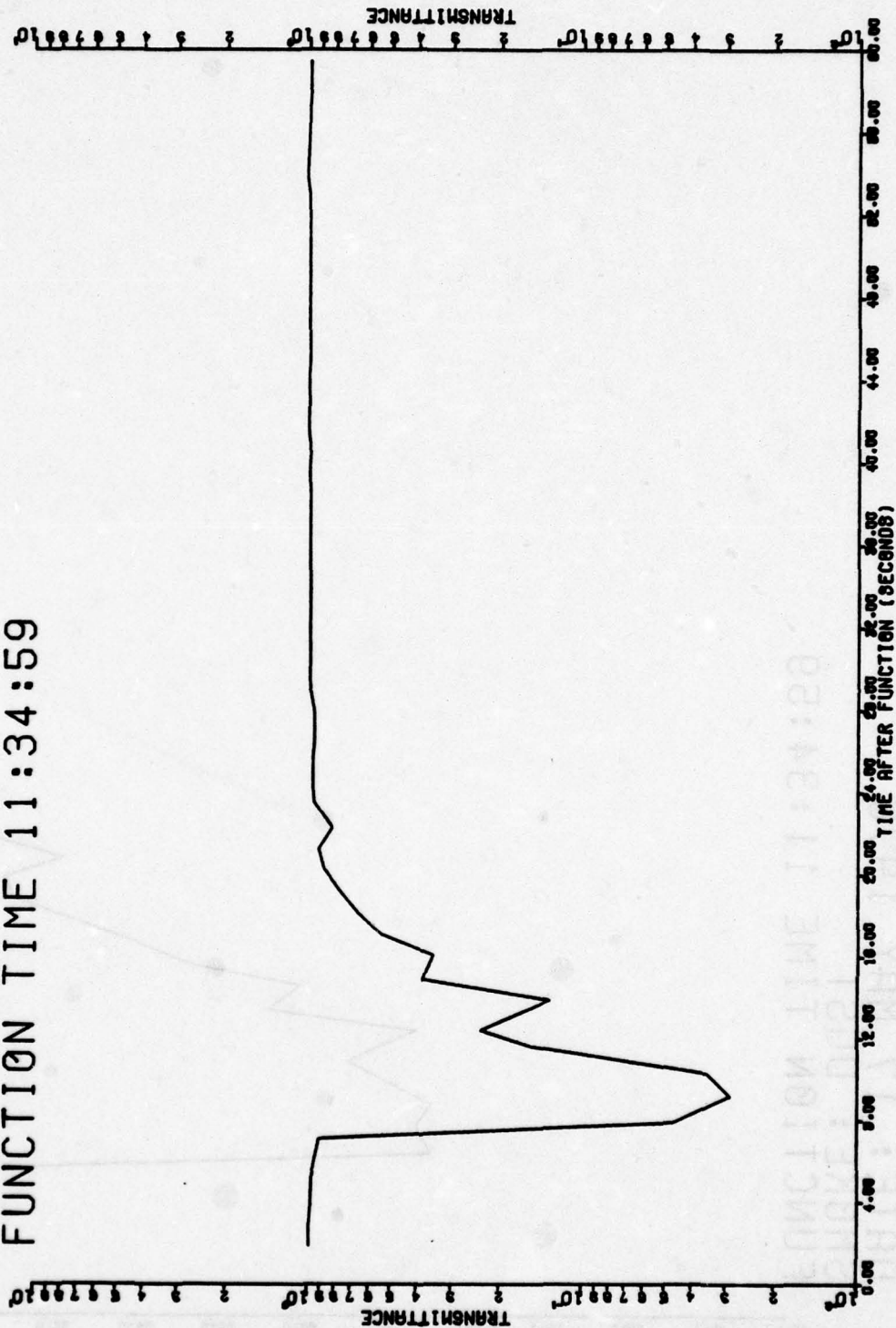
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #18 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:34:59



TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

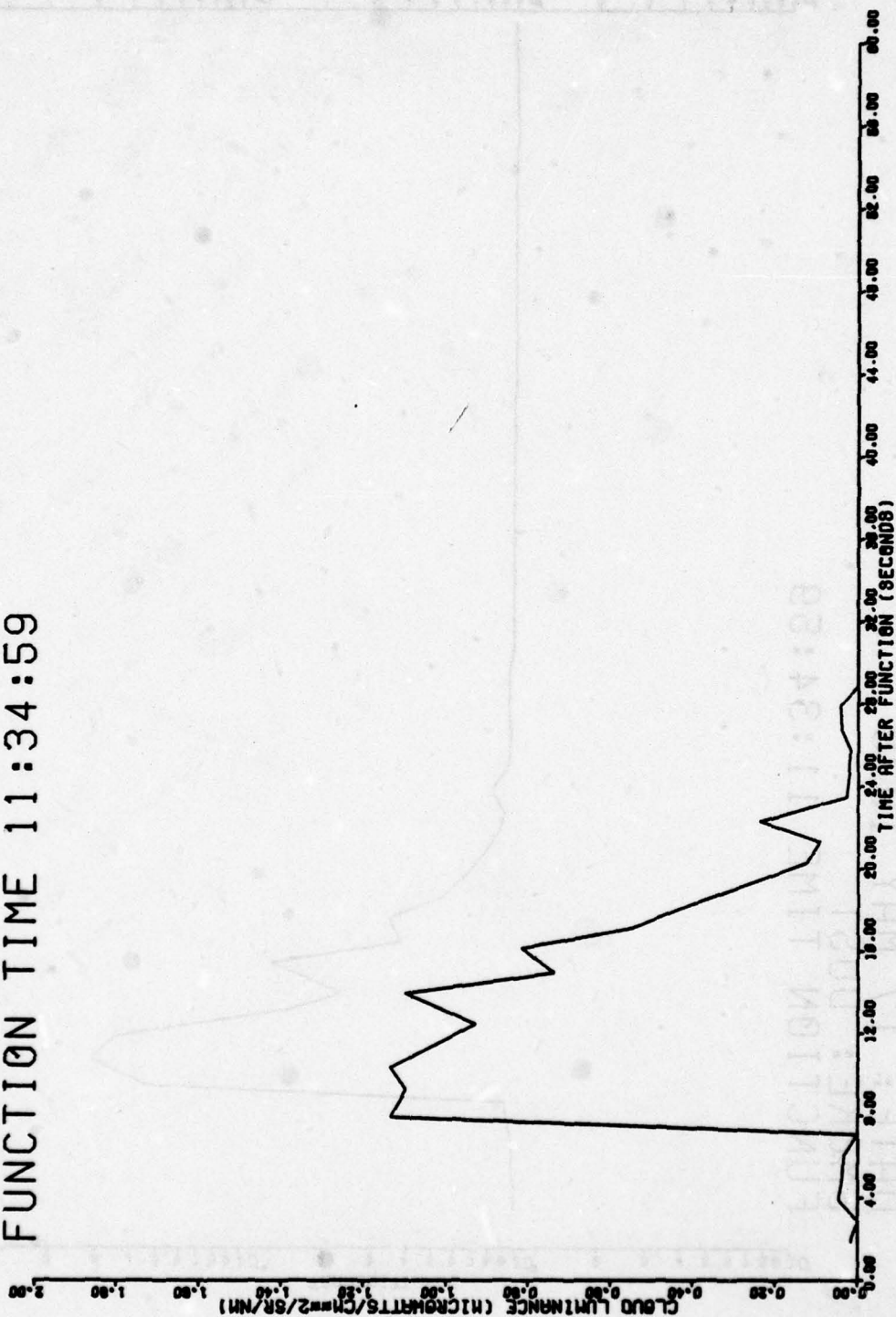
TRIAL #18 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:34:59



TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

B-21-5

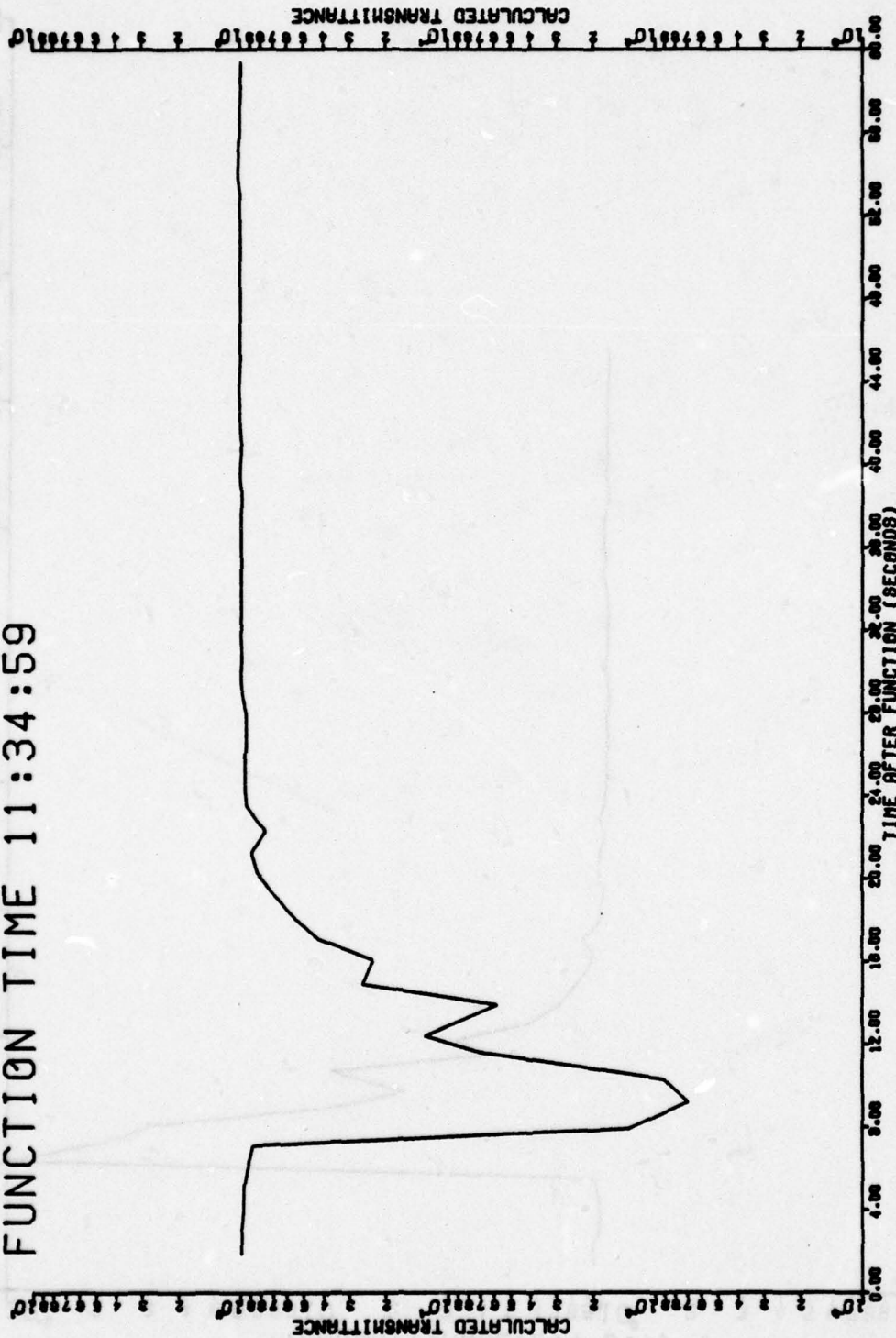
TRIAL #18 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:34:59



CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

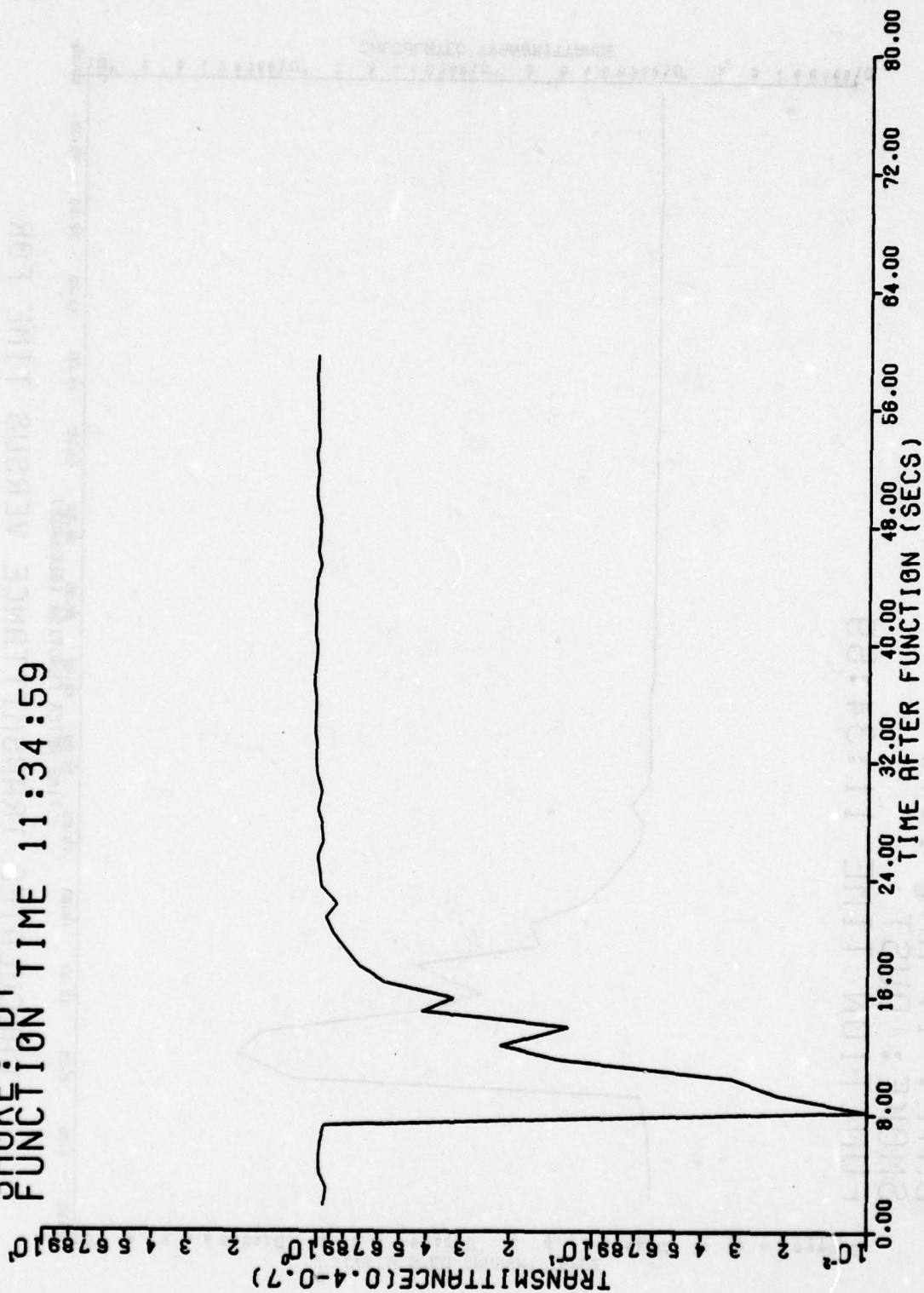
B-21-6

TRIAL #18 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:34:59



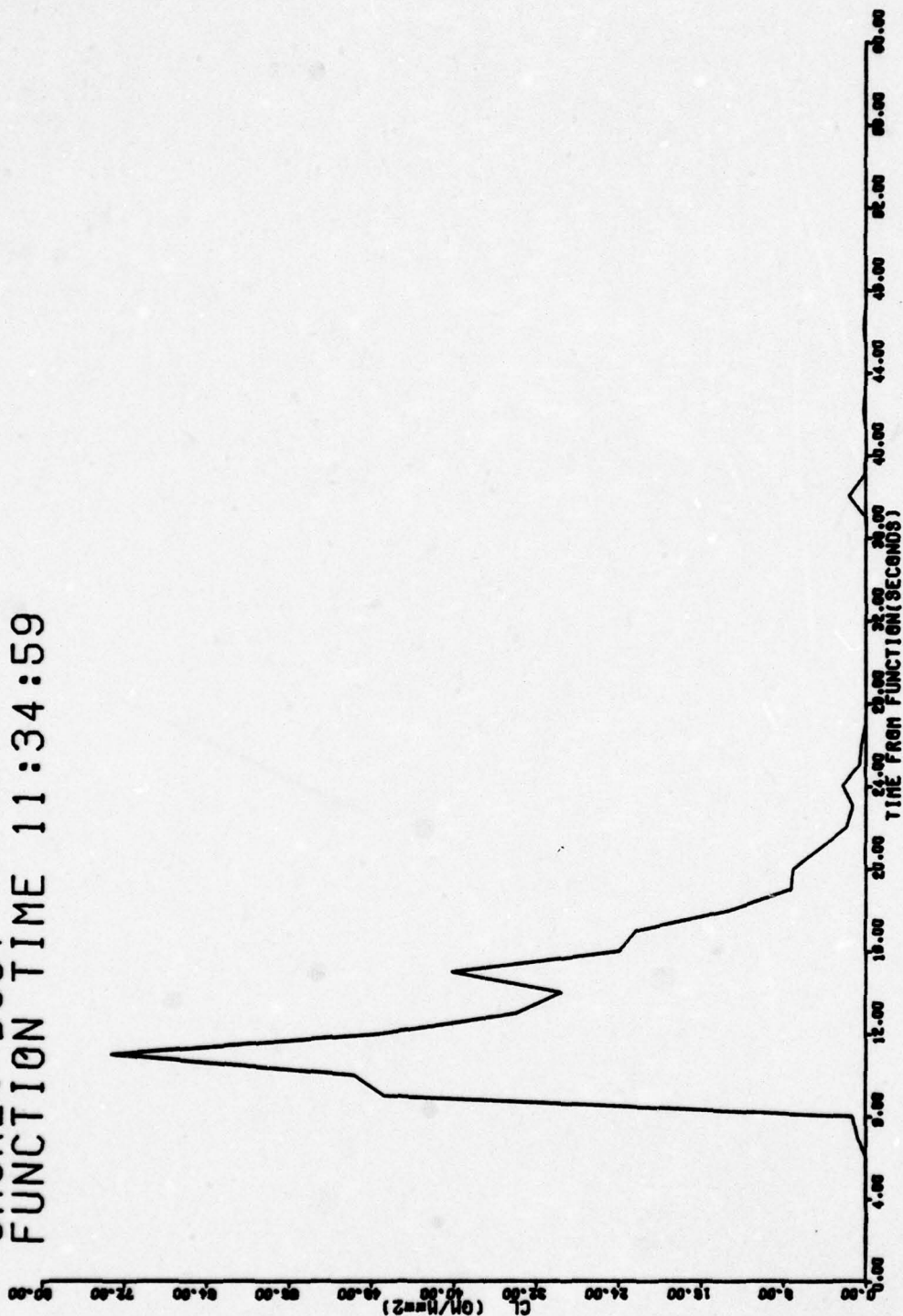
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 18, FT. SILL TESTS  
DATE: 17 MAY 1978  
SMOKE: DT  
FUNCTION TIME 11:34:59



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #18 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:34:59



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 22

CONTENTS

TRIAL DPI-005-TT9 (DUST) 17 MAY 1978

<u>PAGE</u>	
B-22-2	TABLE OF TEST DAY DATA
B-22-3	FIGURE: DOSAGE BY SAMPLING POSITION
B-22-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-22-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-22-6	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-22-7	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-22-8	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-22-9	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-22-10	FIGURE: CL VALUES VERSUS TIME

SUMMARY OF TEST DAY DATA

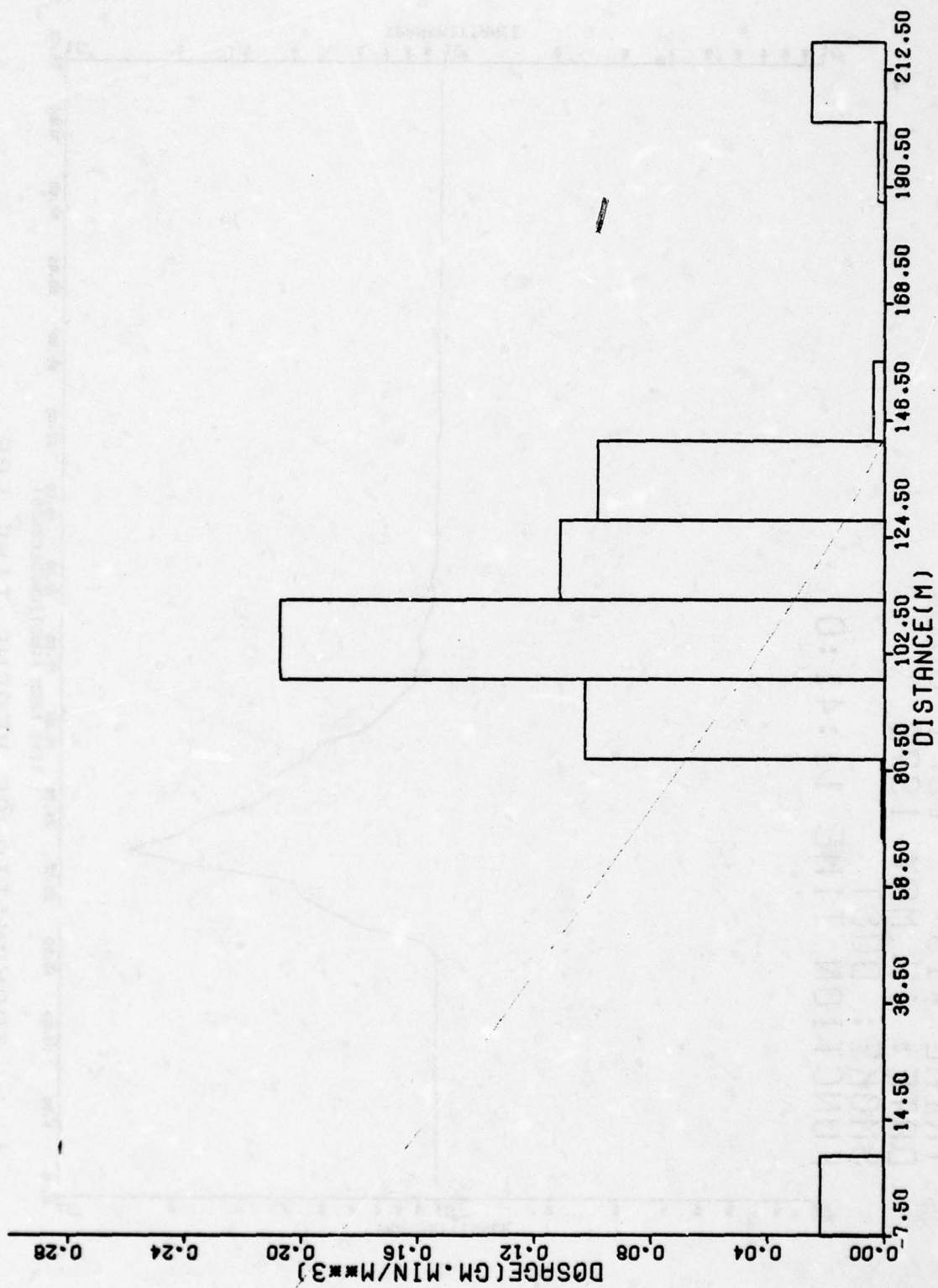
TRIAL: DPI-005-T19

DATE: 17 May 1978

TIME: 1141

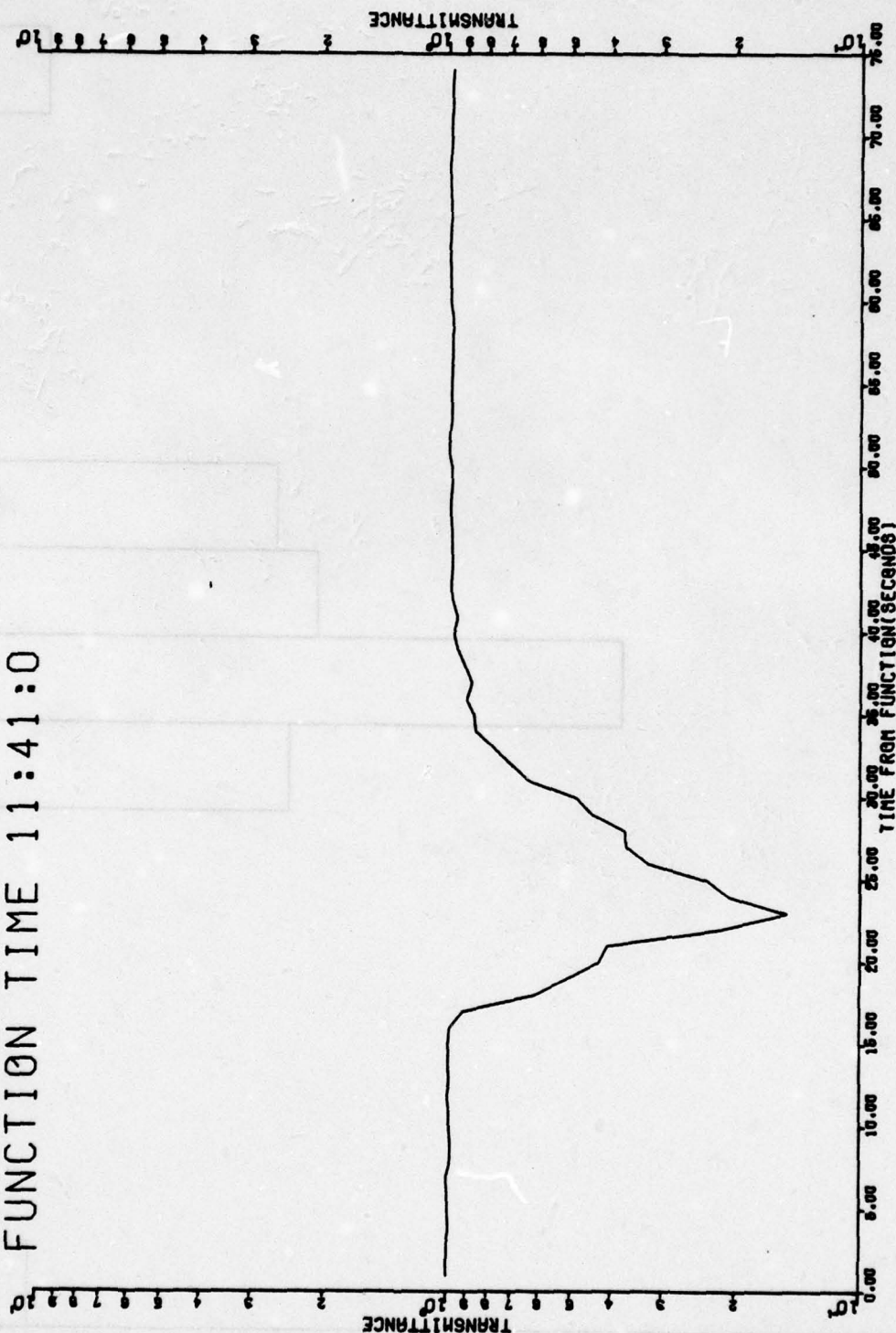
Wind Direction, degrees (2 meter) . . . . .	127
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.0
Relative Humidity, percent (2 meter) . . . . .	87
Temperature . . . . .	61°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	095
Range (meter) . . . . .	126
Particle Size Range ( $\mu\text{m}$ ) . . . . .	Proportion
0.65 - 1.3 . . . . .	0.59
1.3 - 2.3 . . . . .	0.40
2.3 - 10.0 . . . . .	0.01
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	1.20*

\*Graphical estimate provided



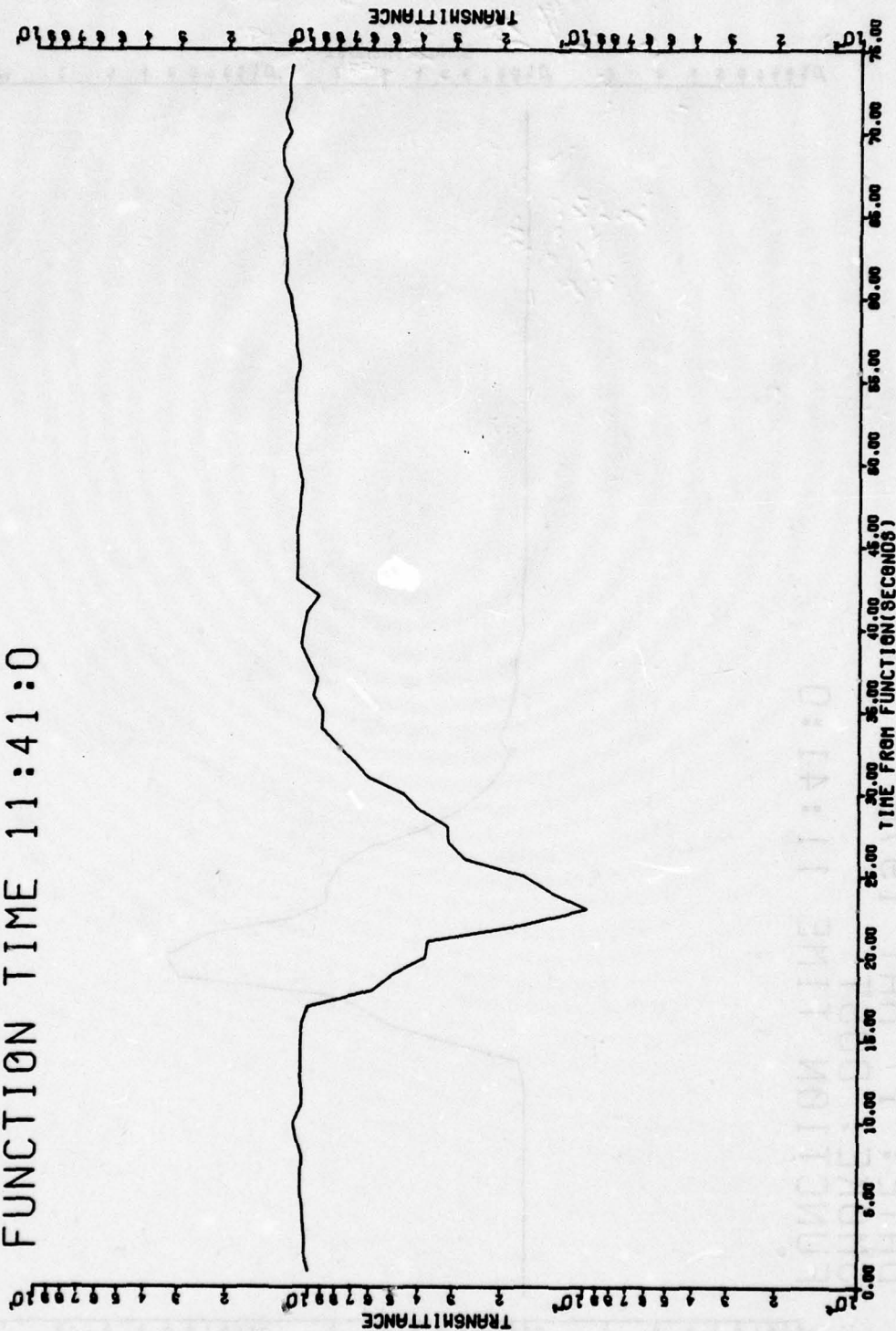
TRIAL 19, FT. SILL TESTS, 17 MAY 78, 11:41:00, DUST

TRIAL #19 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:41:0



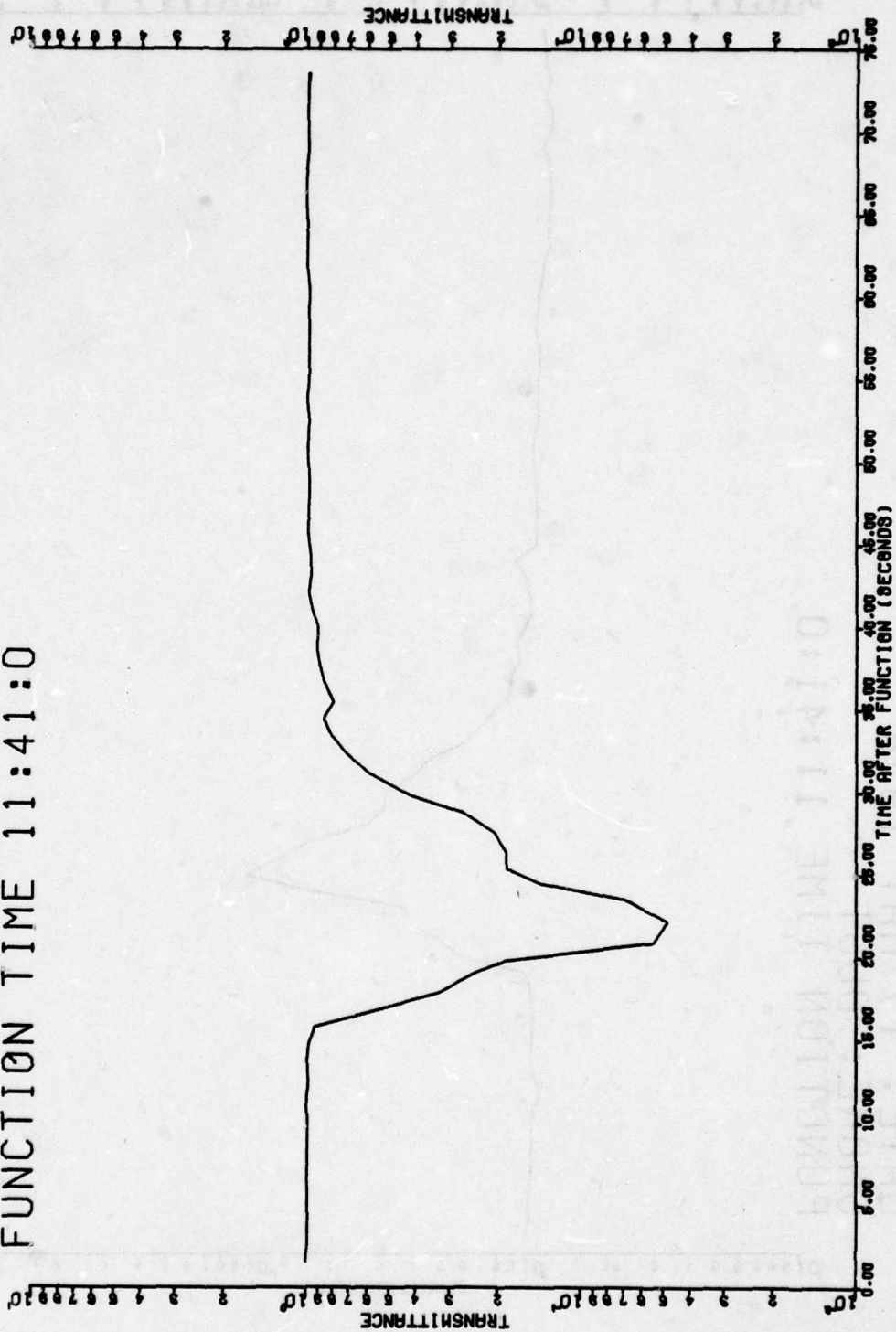
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #19 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:41:0



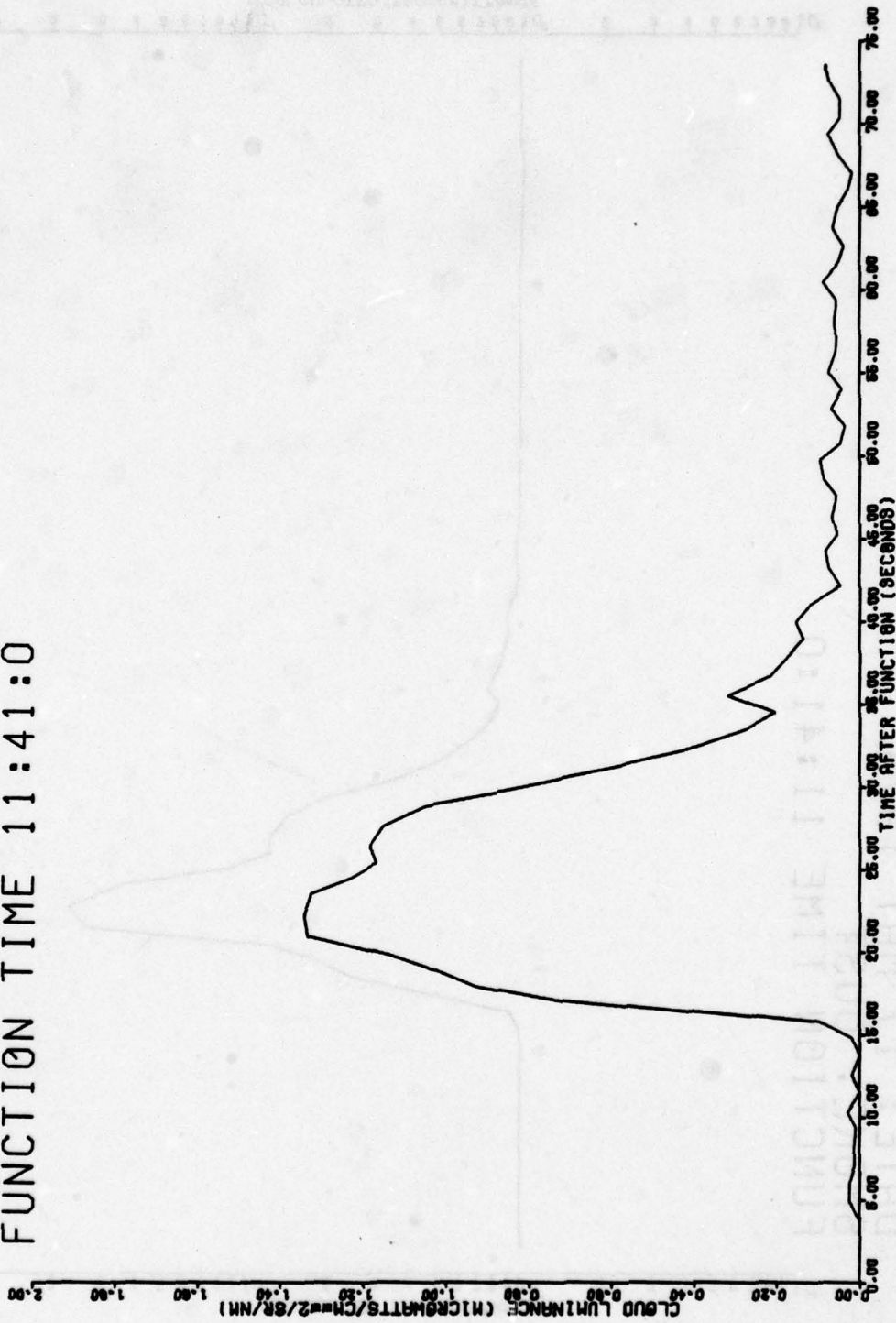
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #19 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:41:0



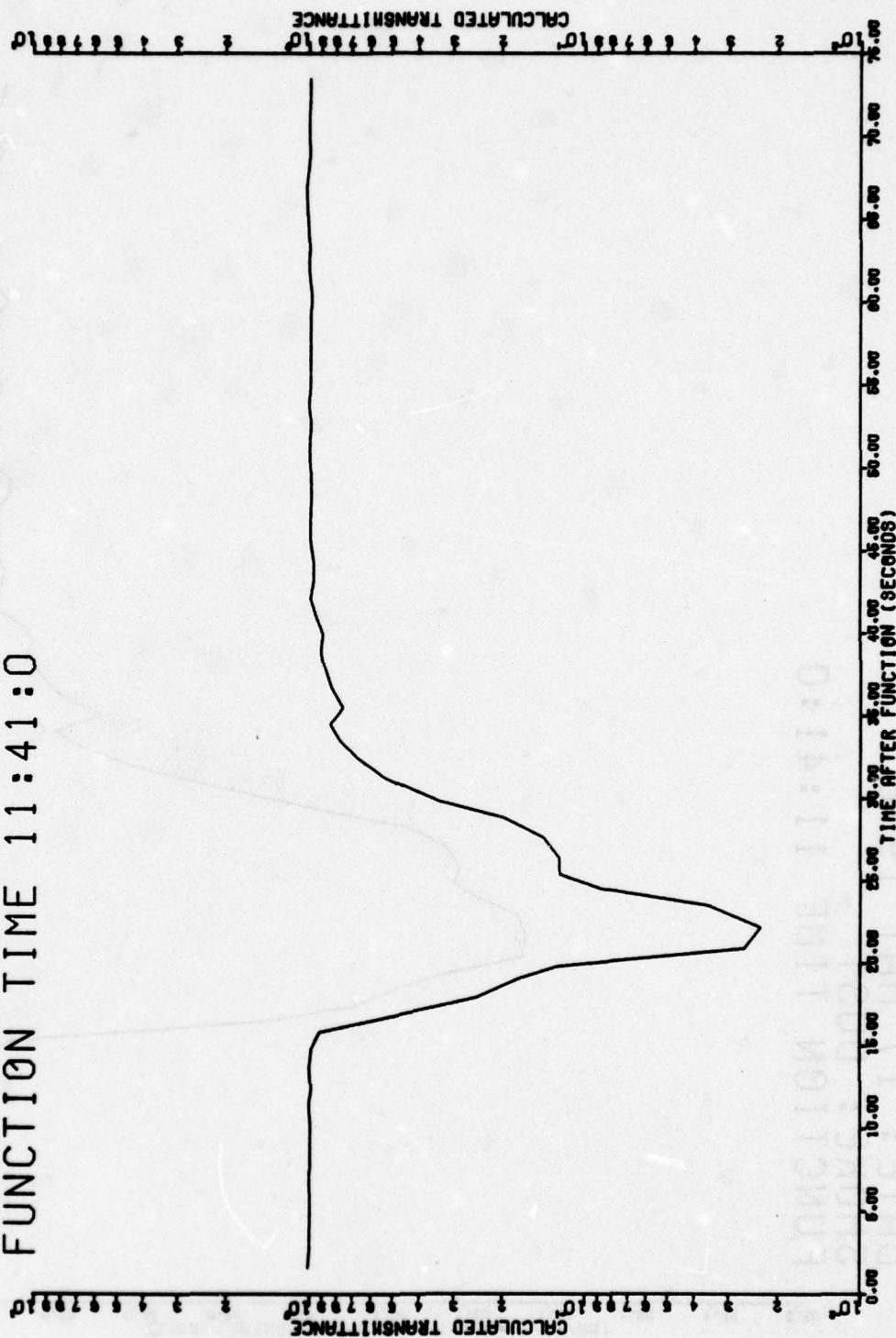
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #19 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:41:0



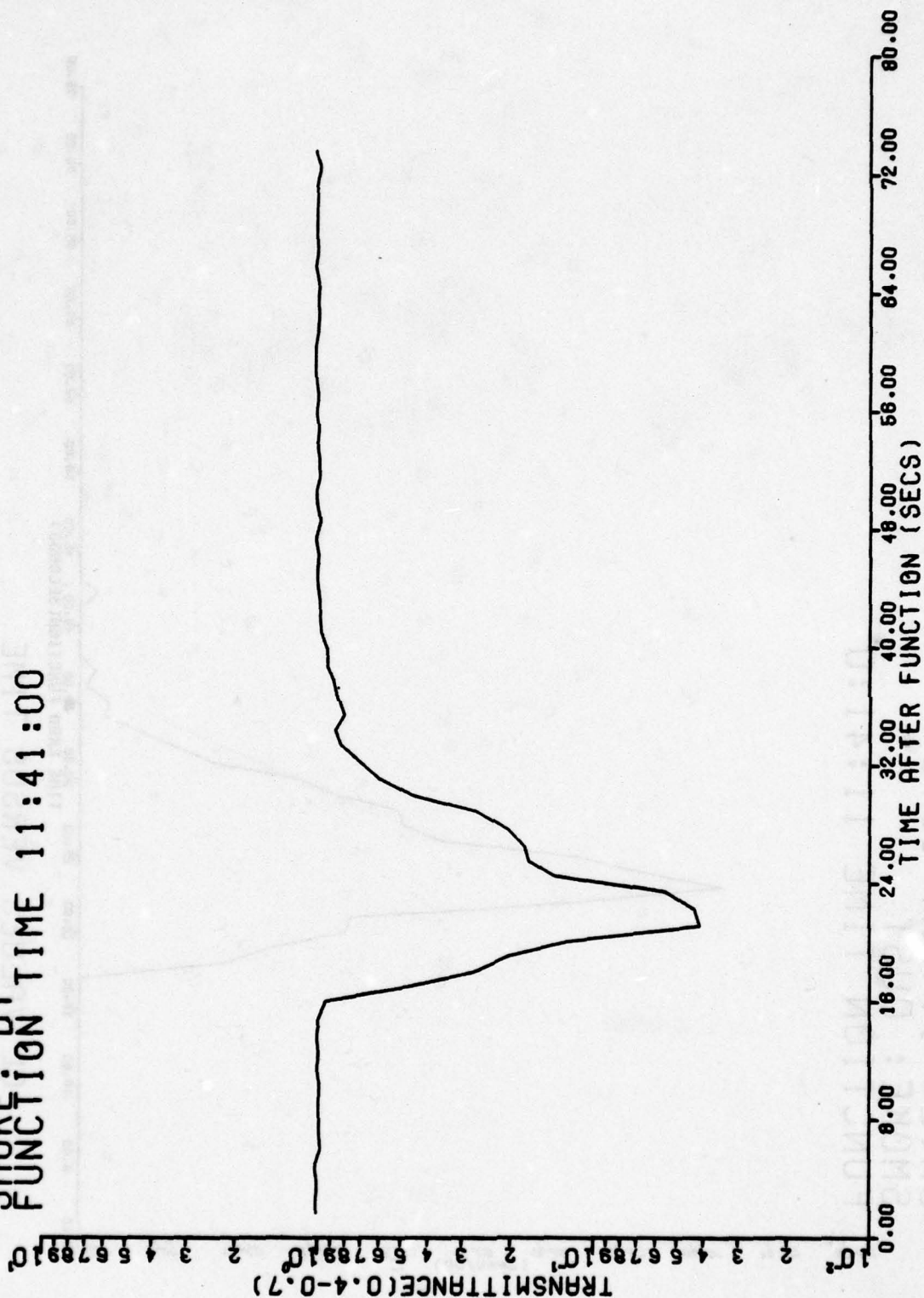
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #19 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:41:0



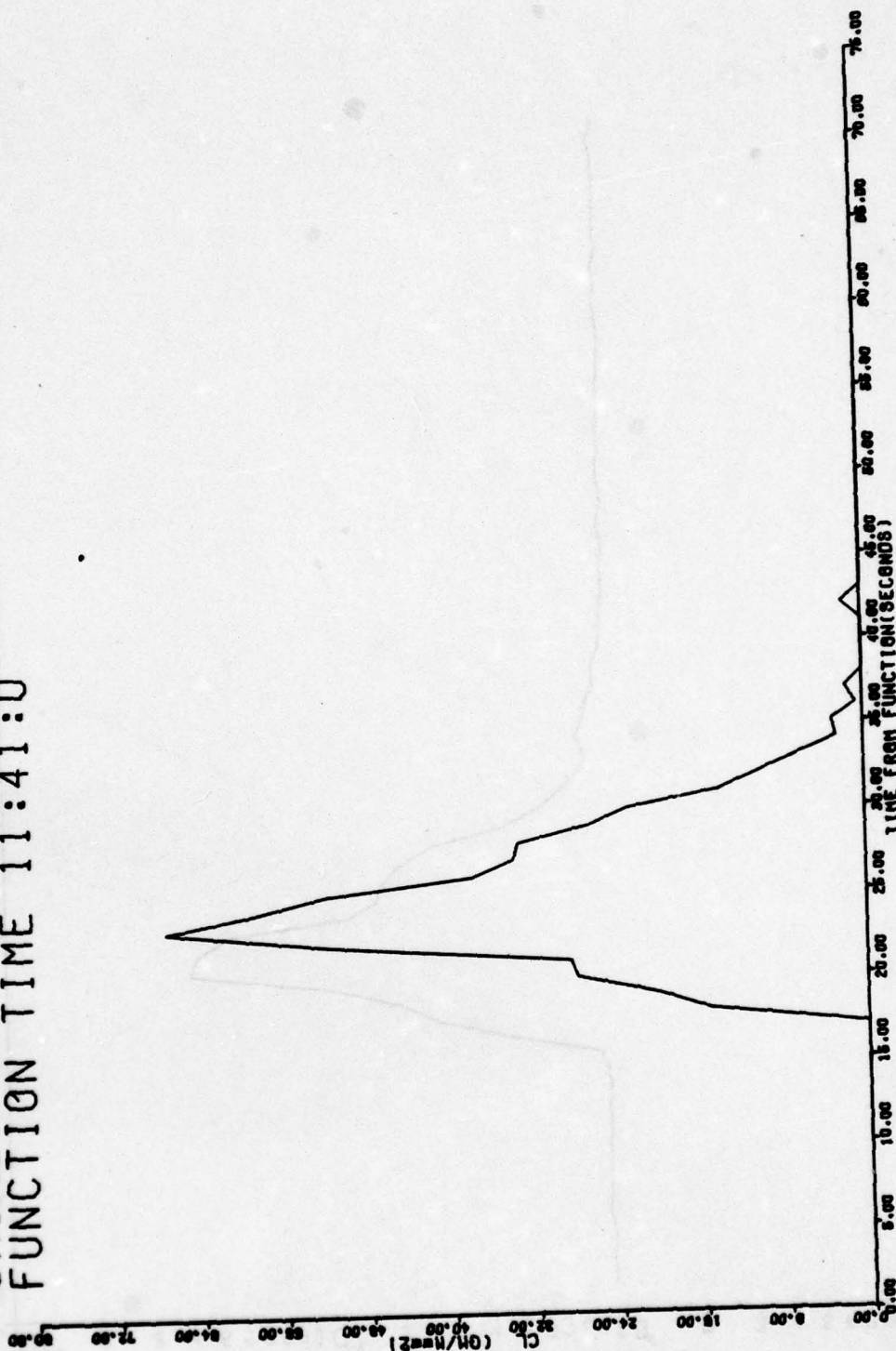
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 19: FT. SILL TESTS  
 DATE: 17 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 11:41:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #19 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:41:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 23

CONTENTS

TRIAL DPI-005-T20 (DUST) 17 MAY 1978

PAGE

B-23-2

TABLE OF TEST DAY DATA

B-23-3

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
9.750  $\mu\text{m}$

B-23-4

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
3.443  $\mu\text{m}$

B-23-5

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-23-6

FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-23-7

FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7  $\mu\text{m}$

B-23-8

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
BETWEEN 0.4 AND 0.7  $\mu\text{m}$

B-23-9

FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

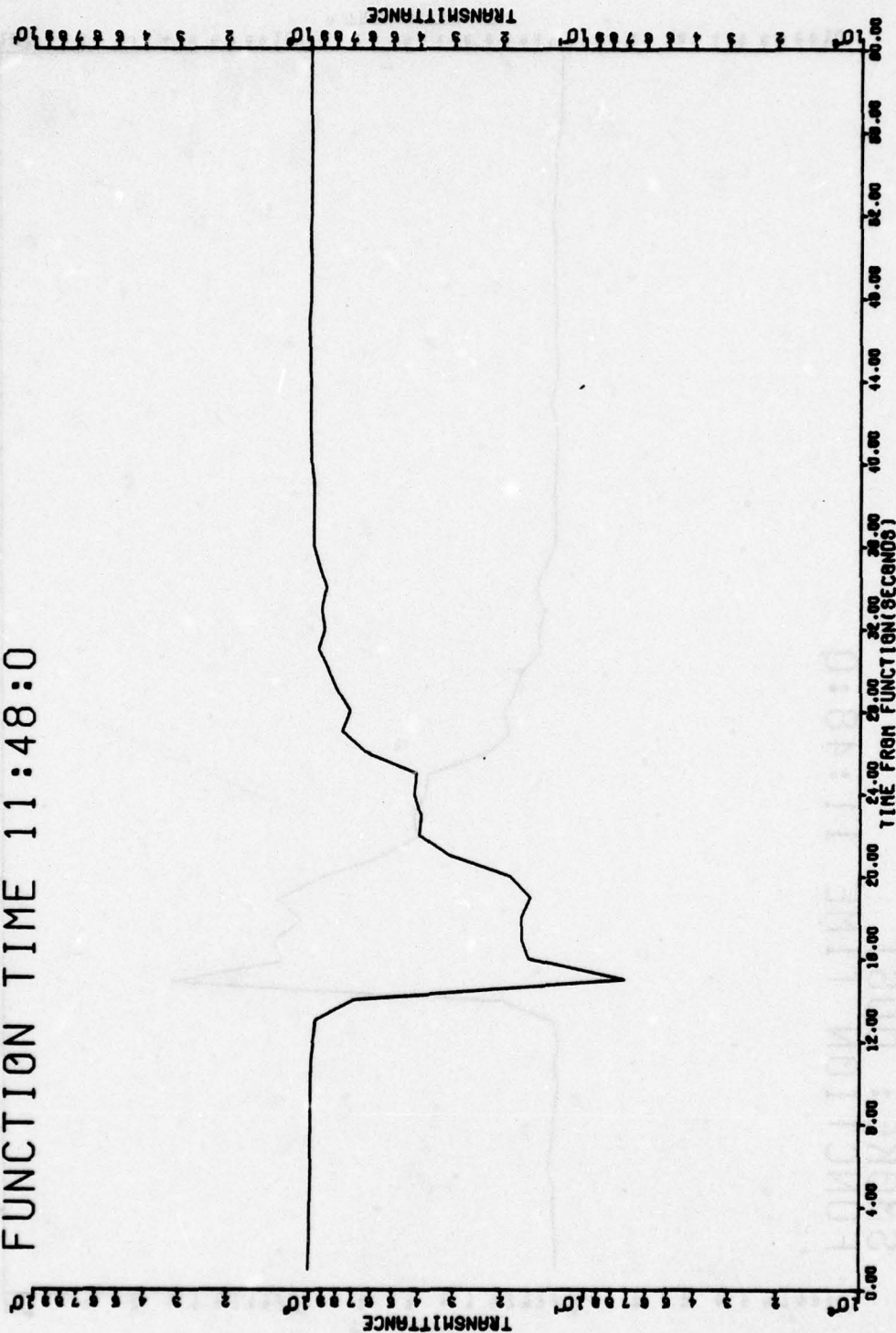
TRIAL: DPI-005-T20

DATE: 17 May 1978

TIME: 1148

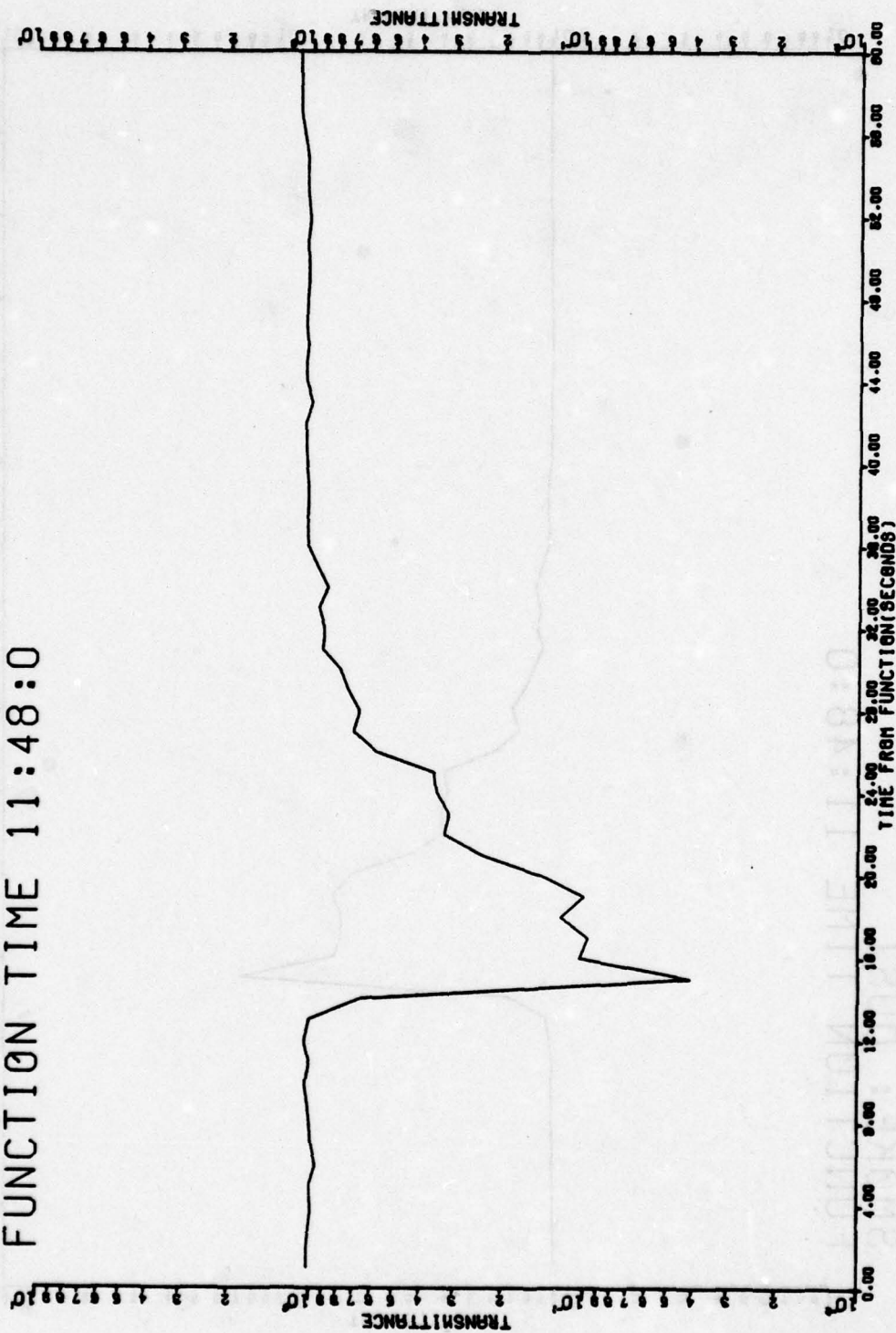
Wind Direction, degrees (2 meter) . . . . .	126
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.4
Relative Humidity, percent (2 meter) . . . . .	87
Temperature . . . . .	61°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	1
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	101
Range (meter) . . . . .	95
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.68
1.3 - 2.3 . . . . .	0.29
2.3 - 10.0 . . . . .	0.03
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
Log <sub>10</sub> NMD . . . . .	0.013
$\sigma\log_{10}$ NMD . . . . .	0.202
NMD ( $\mu\text{m}$ ) . . . . .	1.03

TRIAL #20 [DP1-005]  
 DATE: 16 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:48:0



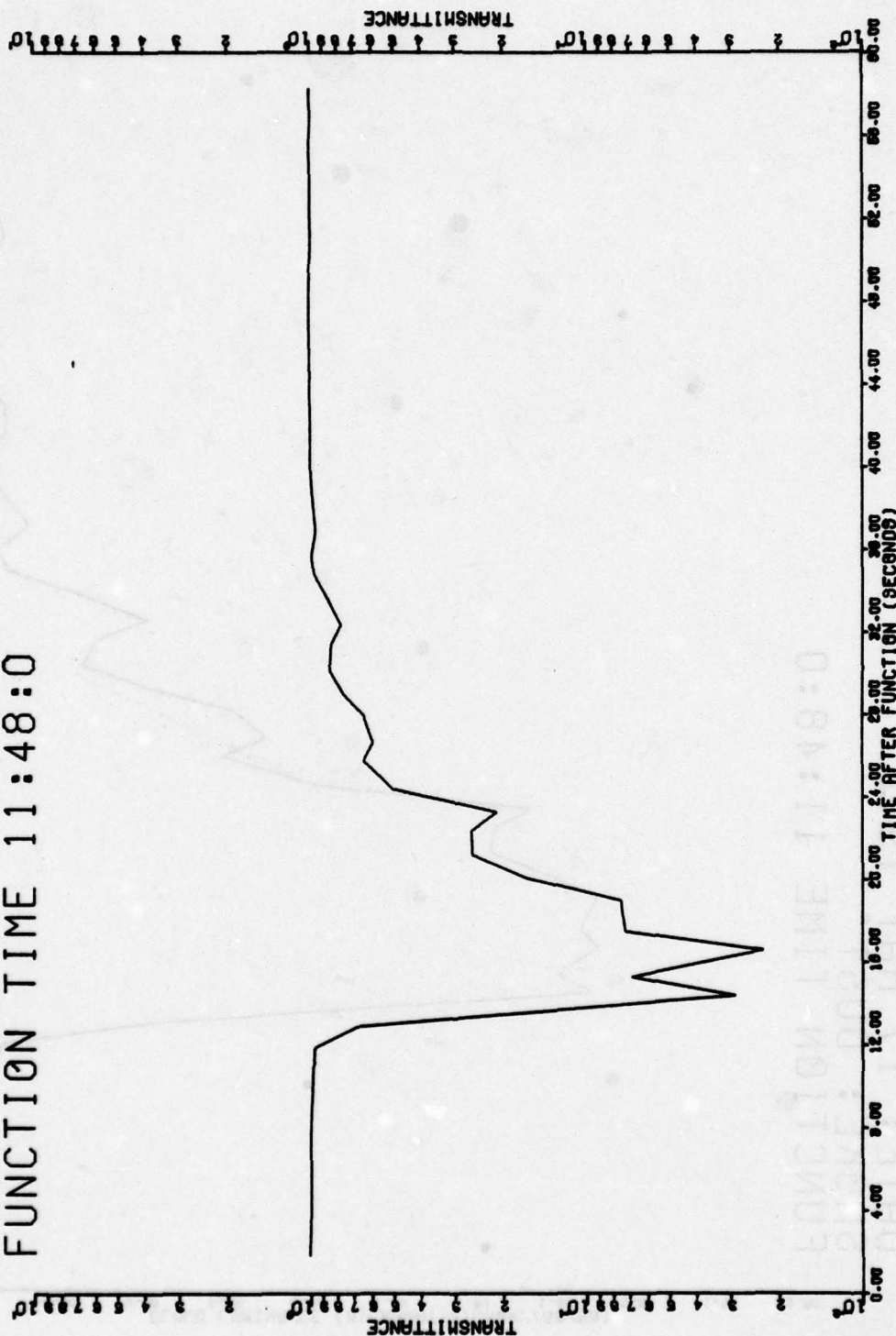
TRANSMITTANCE VERSUS TIME FOR  
 WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #20 [DP1-005]  
DATE: 16 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:48:0



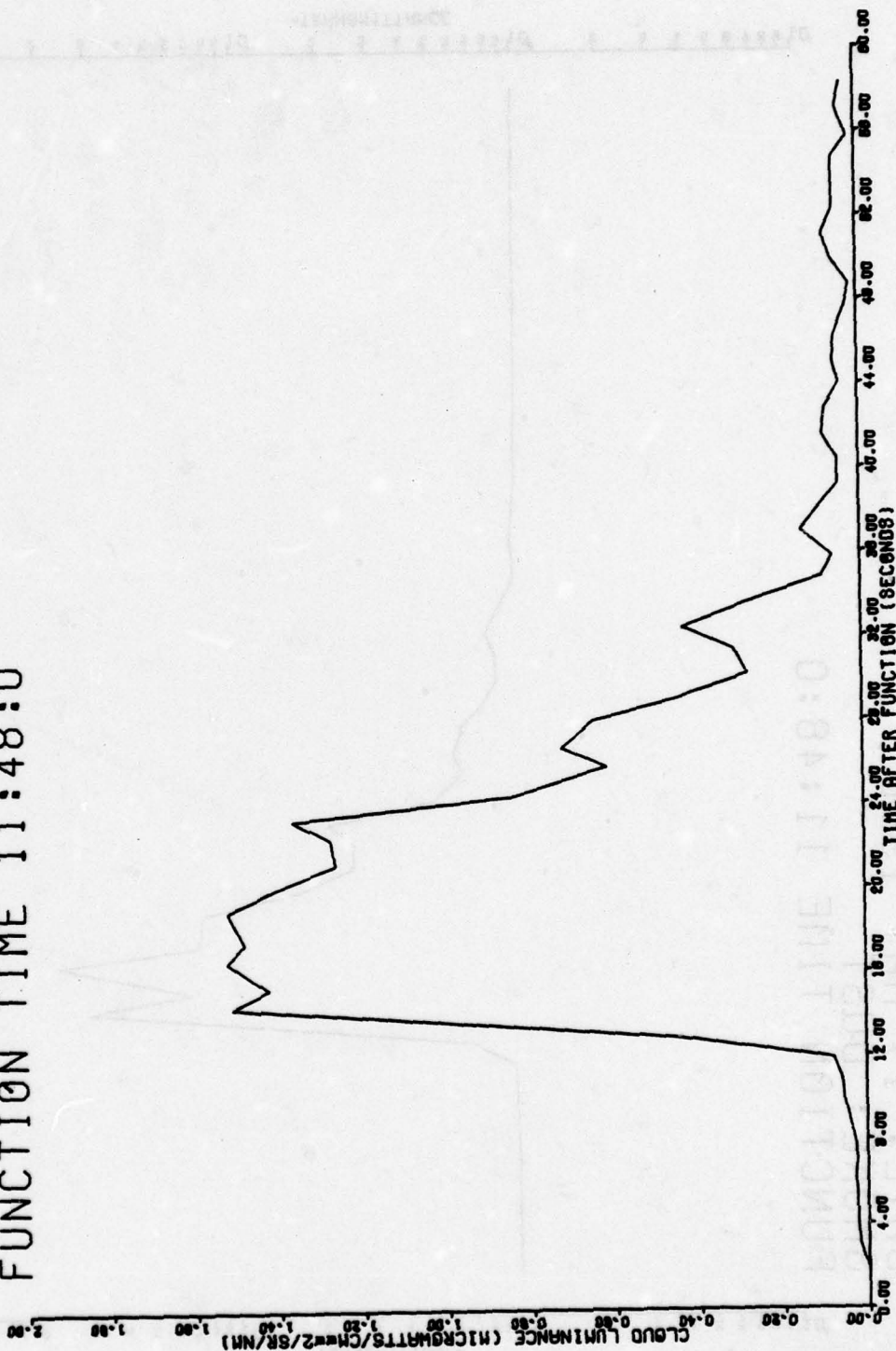
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 ( $\mu\text{m}$ )

TRIAL #20 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:48:0



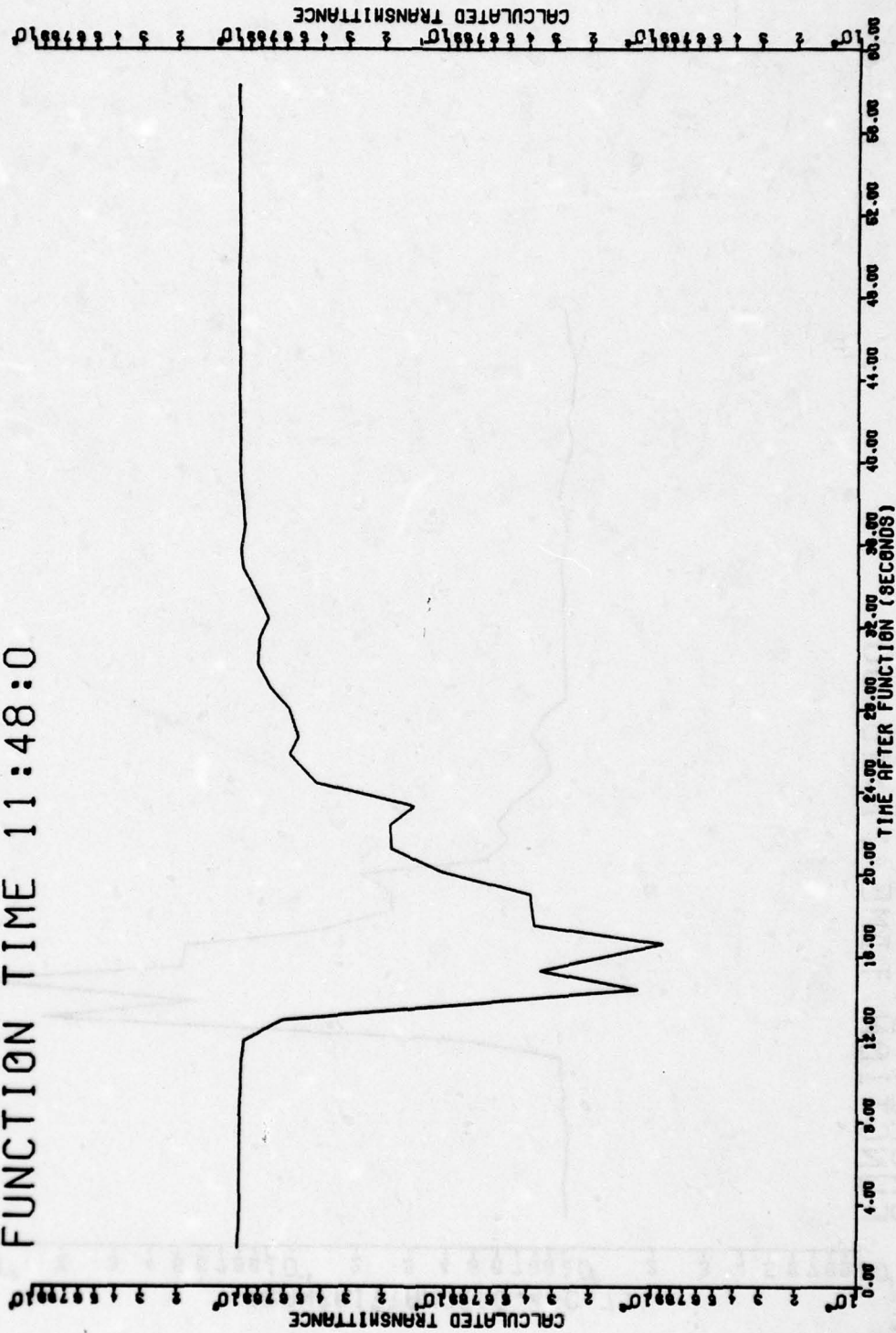
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #20 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:48:0



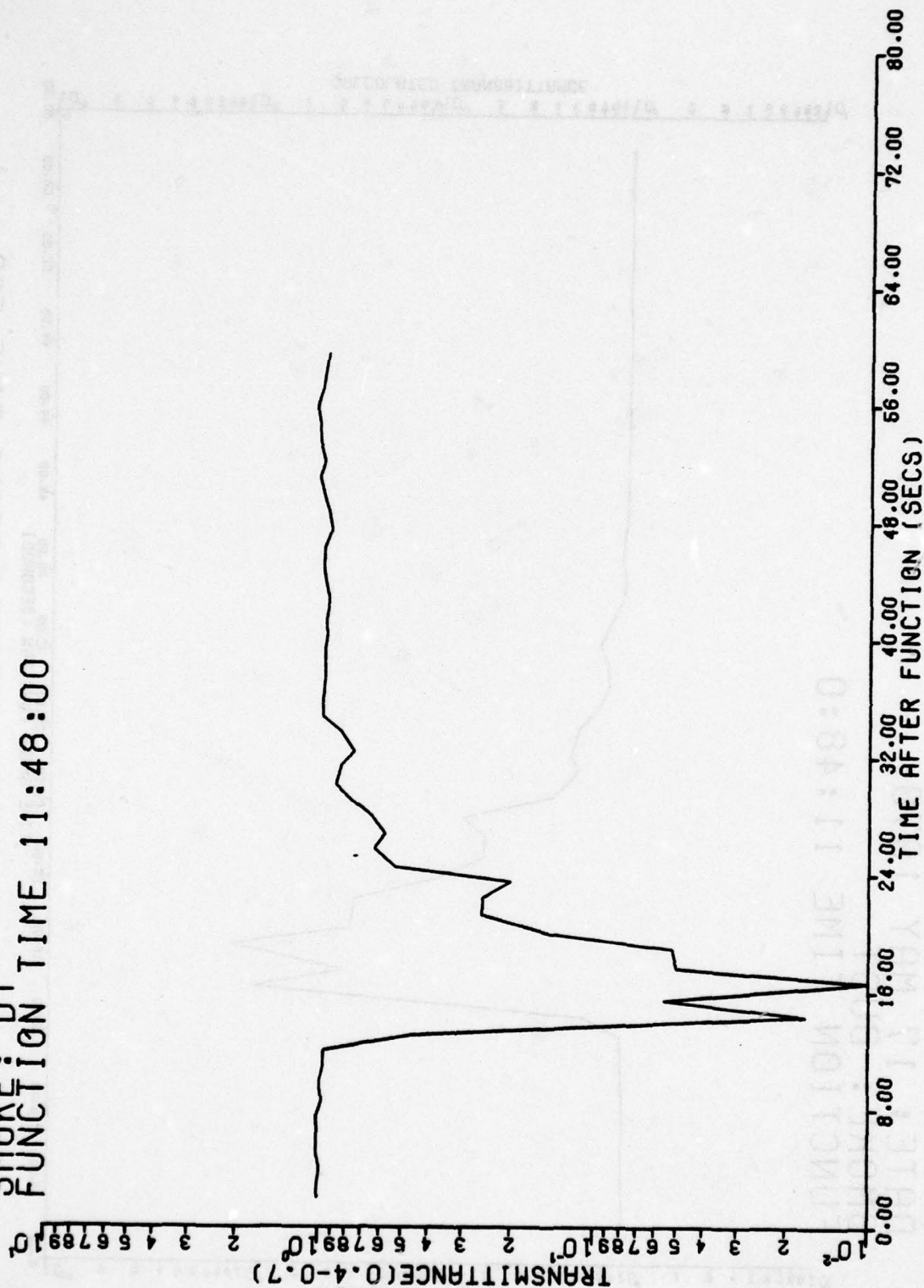
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #20 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:48:0



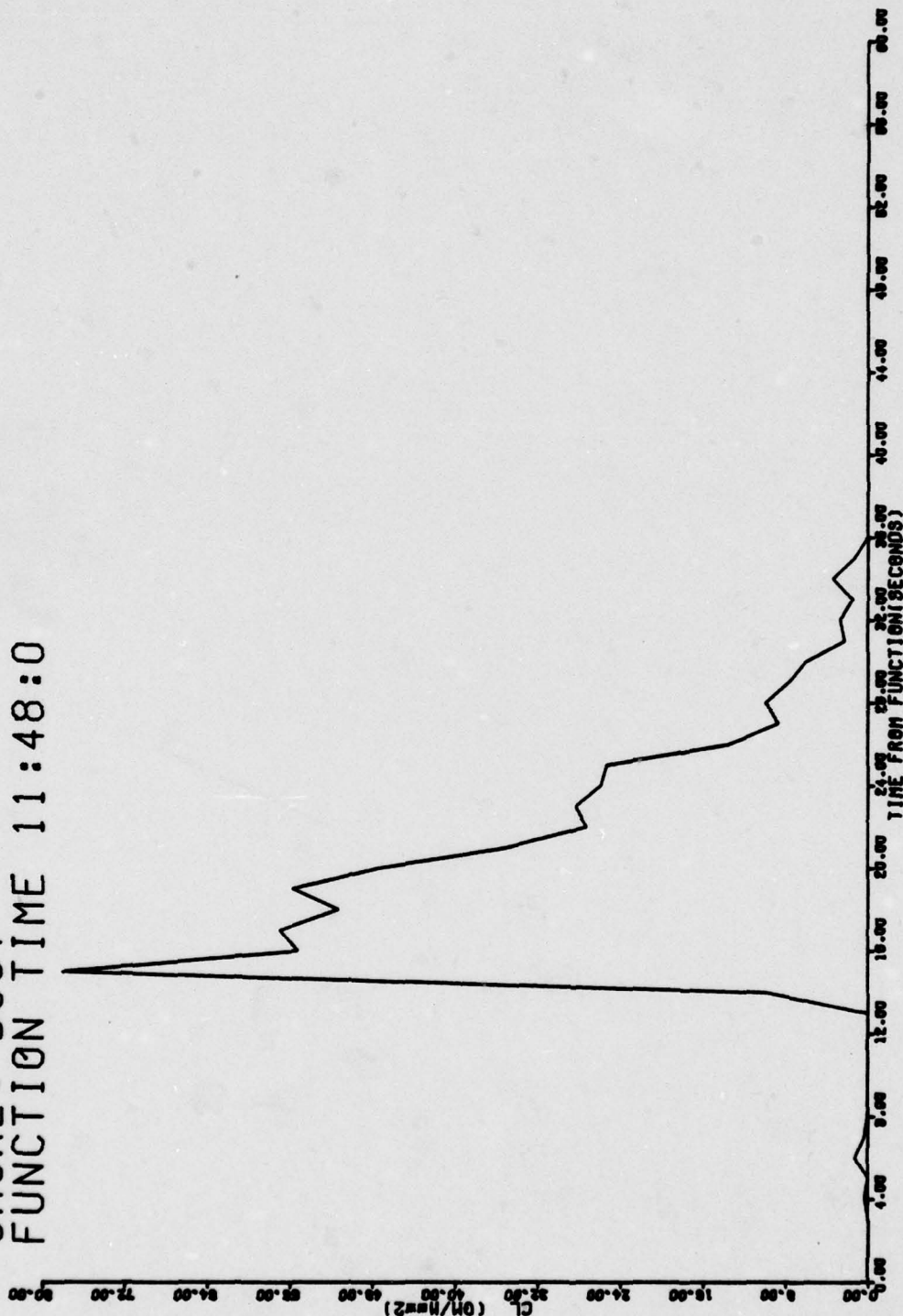
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 20; FT: SILL TESTS  
 DATE: 17 MAY 1978  
 SMOKE: DT  
 FUNCTION TIME 11:48:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
 0.4 AND 0.7 ( $\mu\text{m}$ )

TRIAL #20 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:48:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 24

CONTENTS

TRIAL DPI-005-T21 (DUST) 17 MAY 1978

<u>PAGE</u>	
B-24-2	TABLE OF TEST DAY DATA
B-24-3	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 9.750 $\mu\text{m}$
B-24-4	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 3.443 $\mu\text{m}$
B-24-5	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-24-6	FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH 1.06 $\mu\text{m}$
B-24-7	FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR WAVELENGTH 0.4-0.7 $\mu\text{m}$
B-24-8	FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH BETWEEN 0.4 AND 0.7 $\mu\text{m}$
B-24-9	FIGURE: CL VALUES VERSUS TIME

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T21

DATE: 17 May 1978

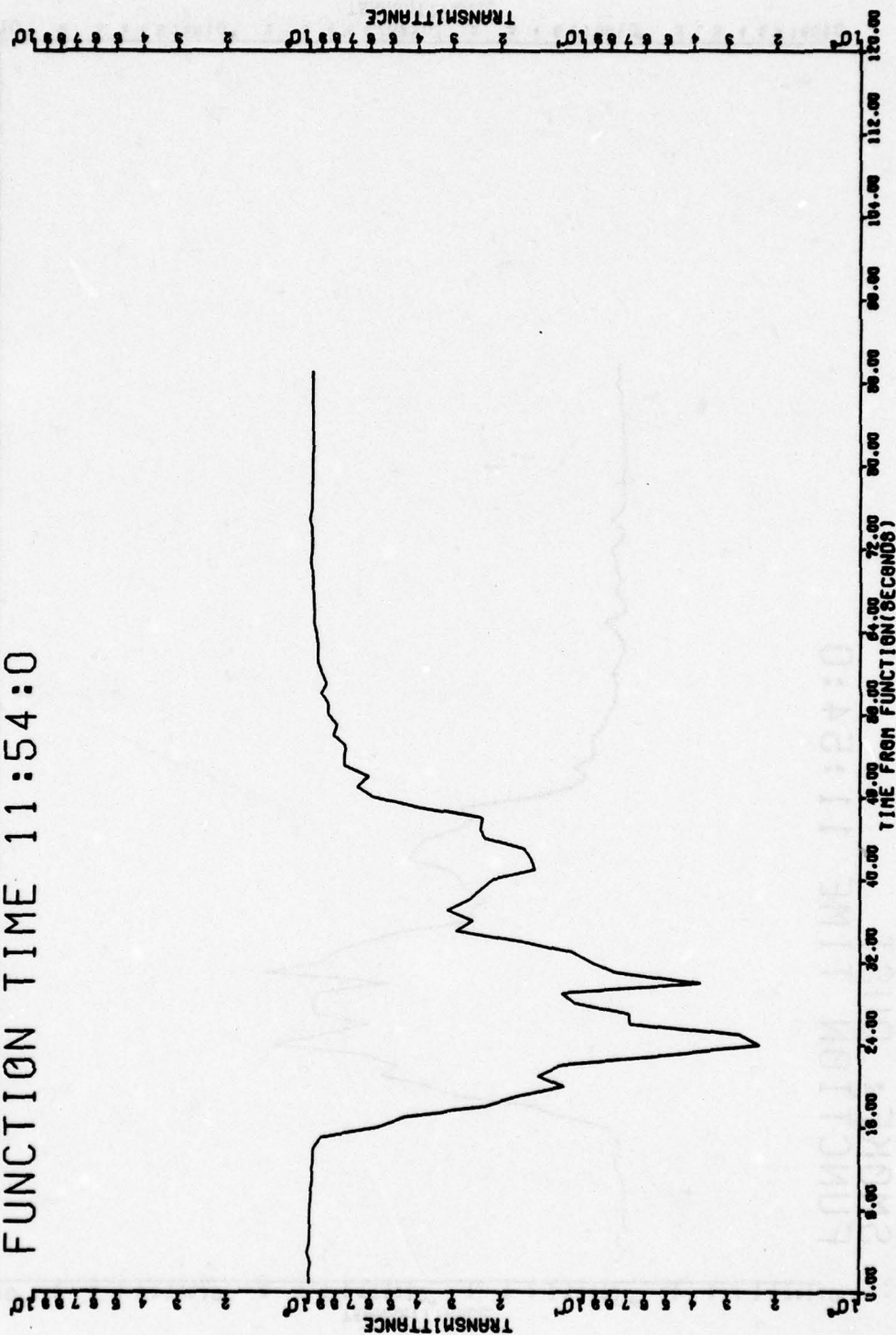
TIME: 1154

Wind Direction, degrees (2 meter) . . . . .	123
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.2
Relative Humidity, percent (2 meter) . . . . .	87
Temperature . . . . .	61°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	4
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	097*
Range (meter) . . . . .	118
Particle Size Range ( $\mu\text{m}$ ) . . . . .	Proportion
0.65 - 1.3 . . . . .	0.60
1.3 - 2.3 . . . . .	0.39
2.3 - 10.0 . . . . .	0.00
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	< 1.3**

\*Average Azimuth and Range for first and fourth rounds.

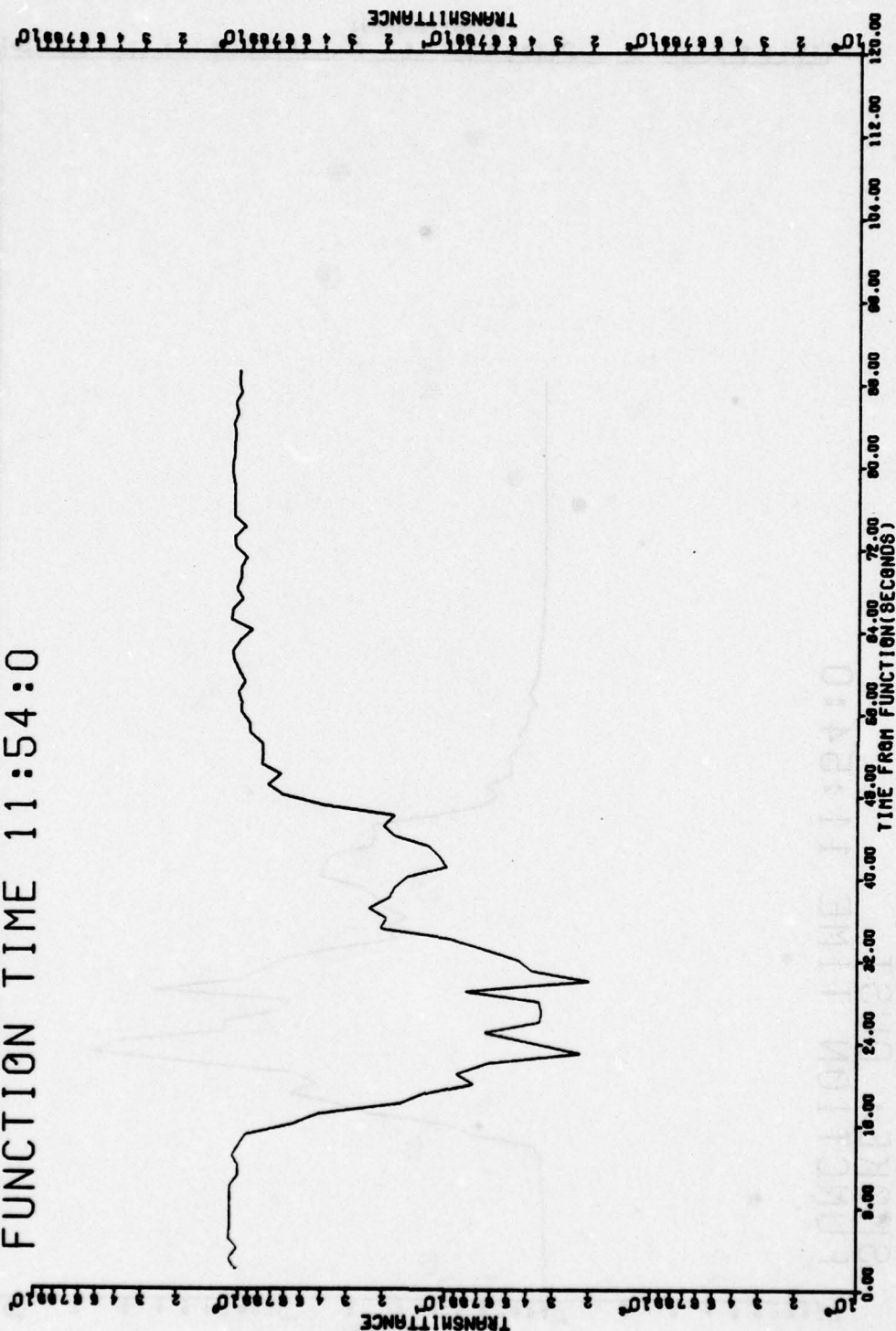
\*\*This figure represents an upper bound to the NMD, since it is not possible to compute an NMD with probit analysis or to obtain a graphical estimate.

TRIAL #21 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:54:0



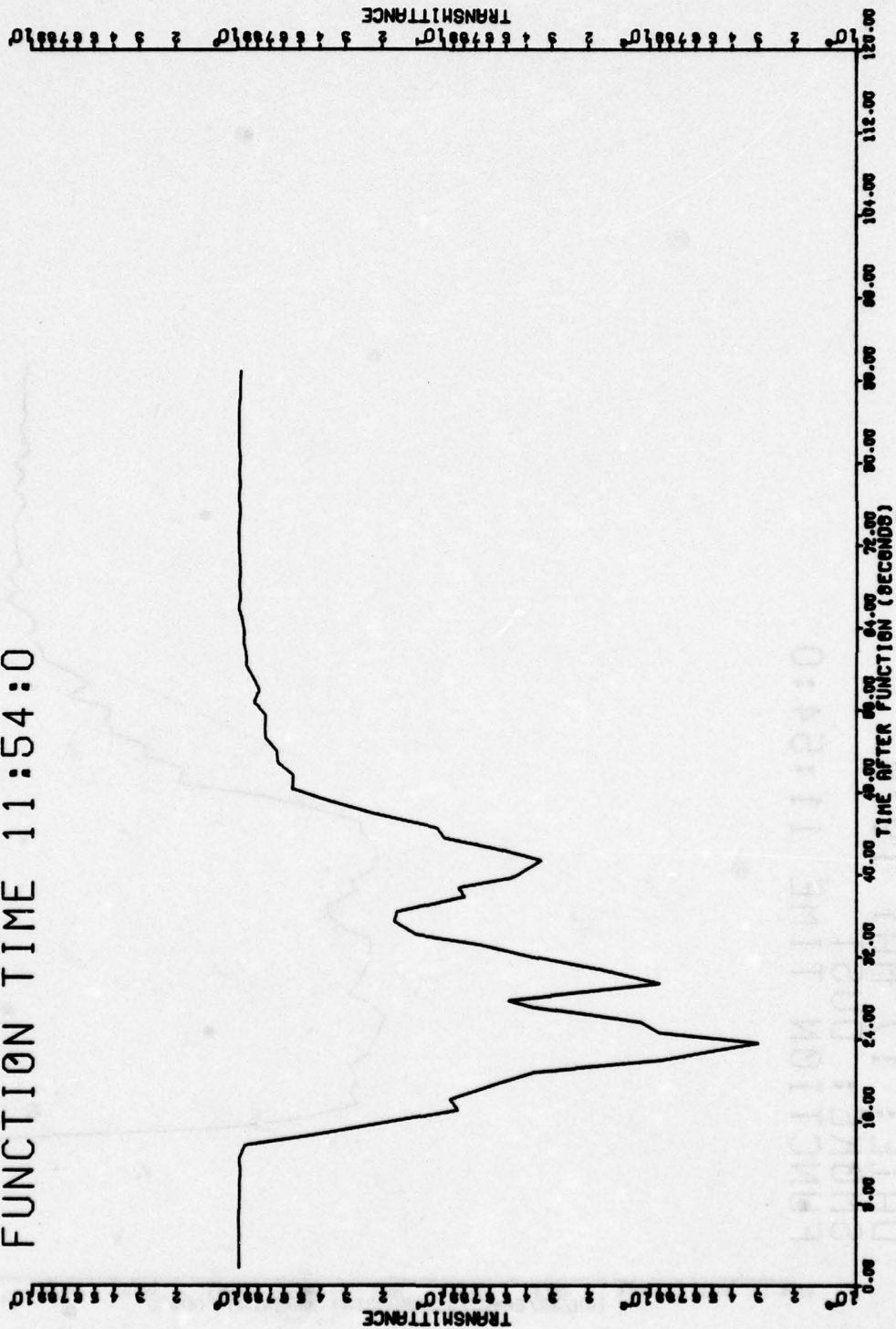
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 9.750 ( $\mu\text{m}$ )

TRIAL #21 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:54:0



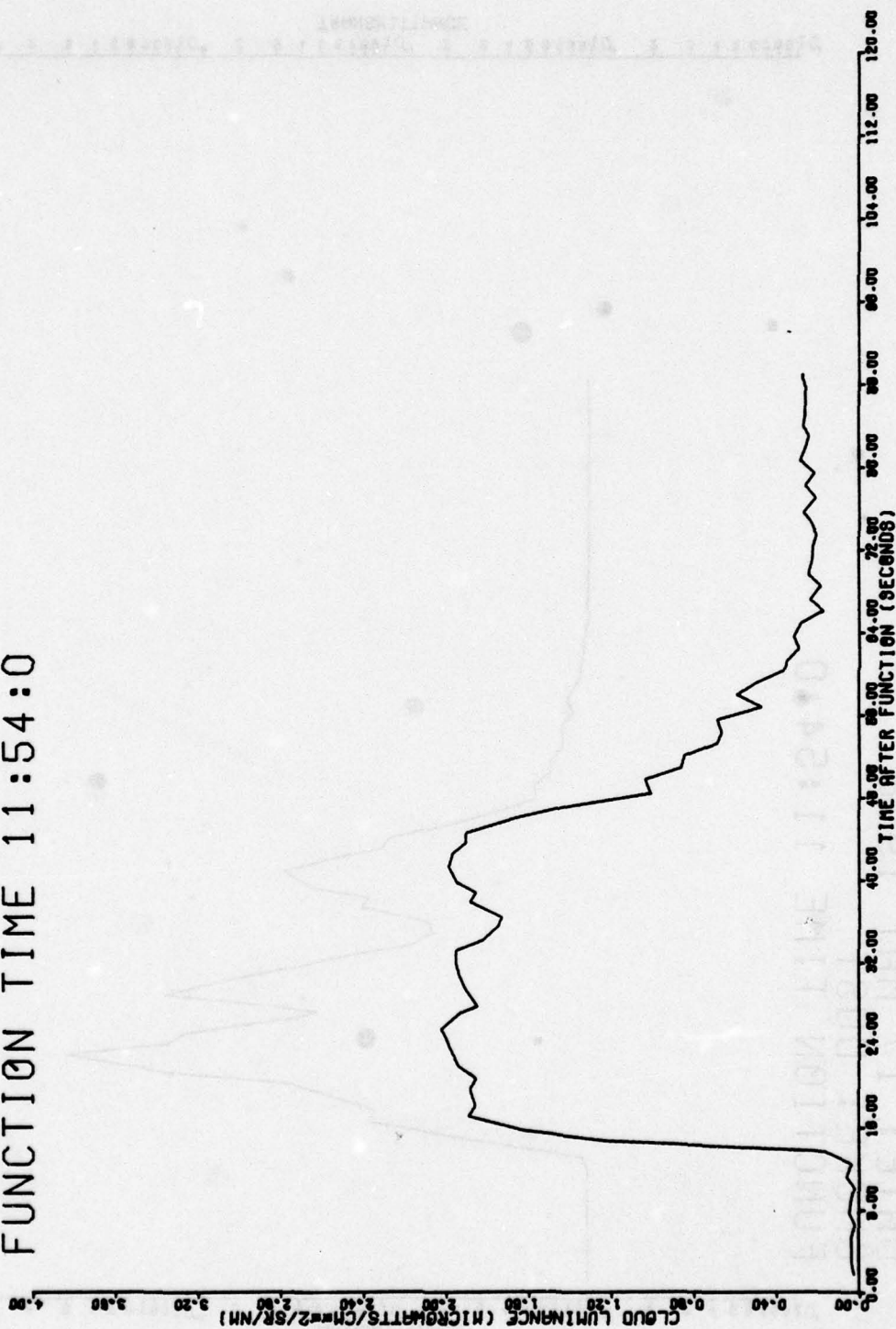
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 3.443 (μm)

TRIAL #21 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:54:0



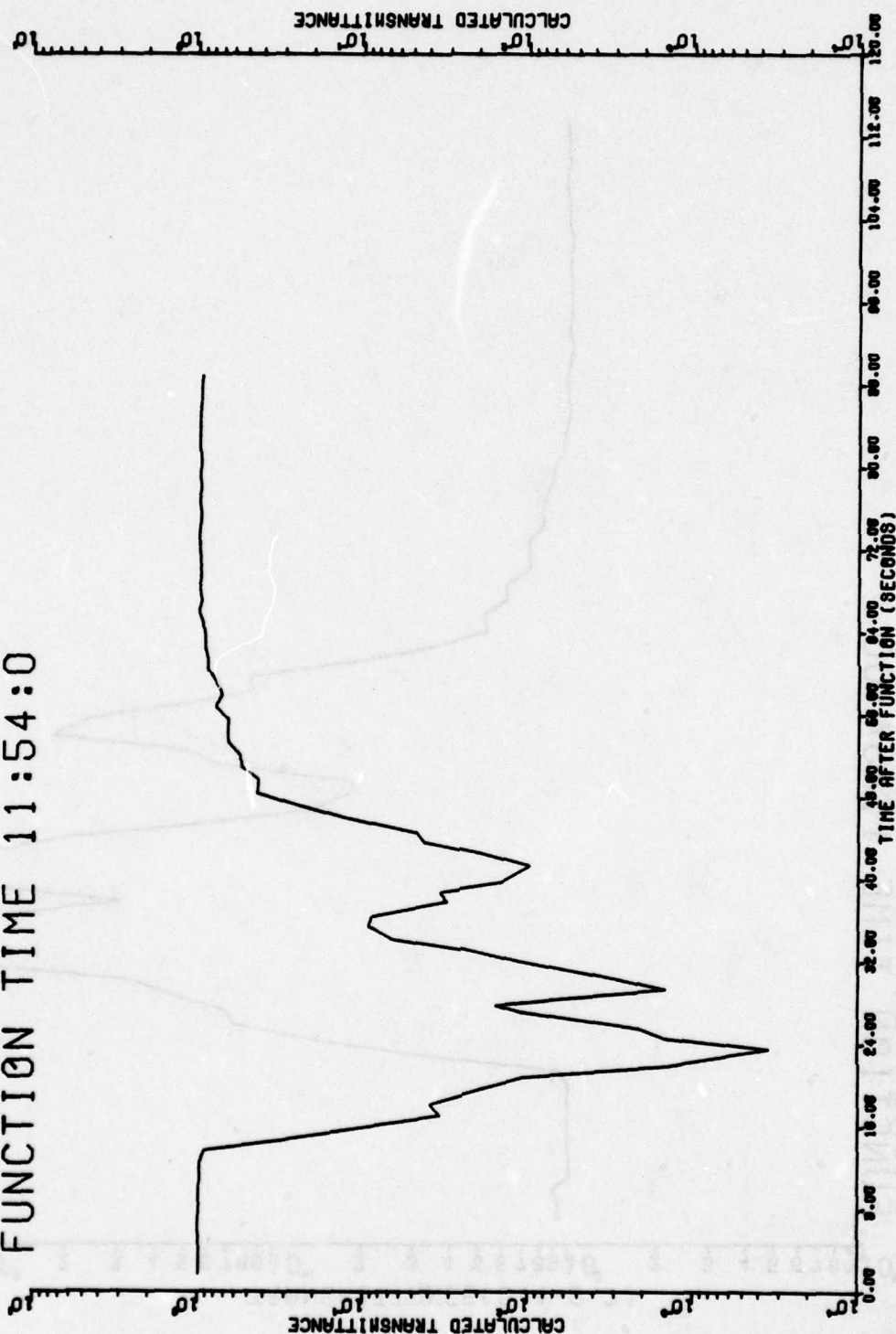
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #21 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:54:0



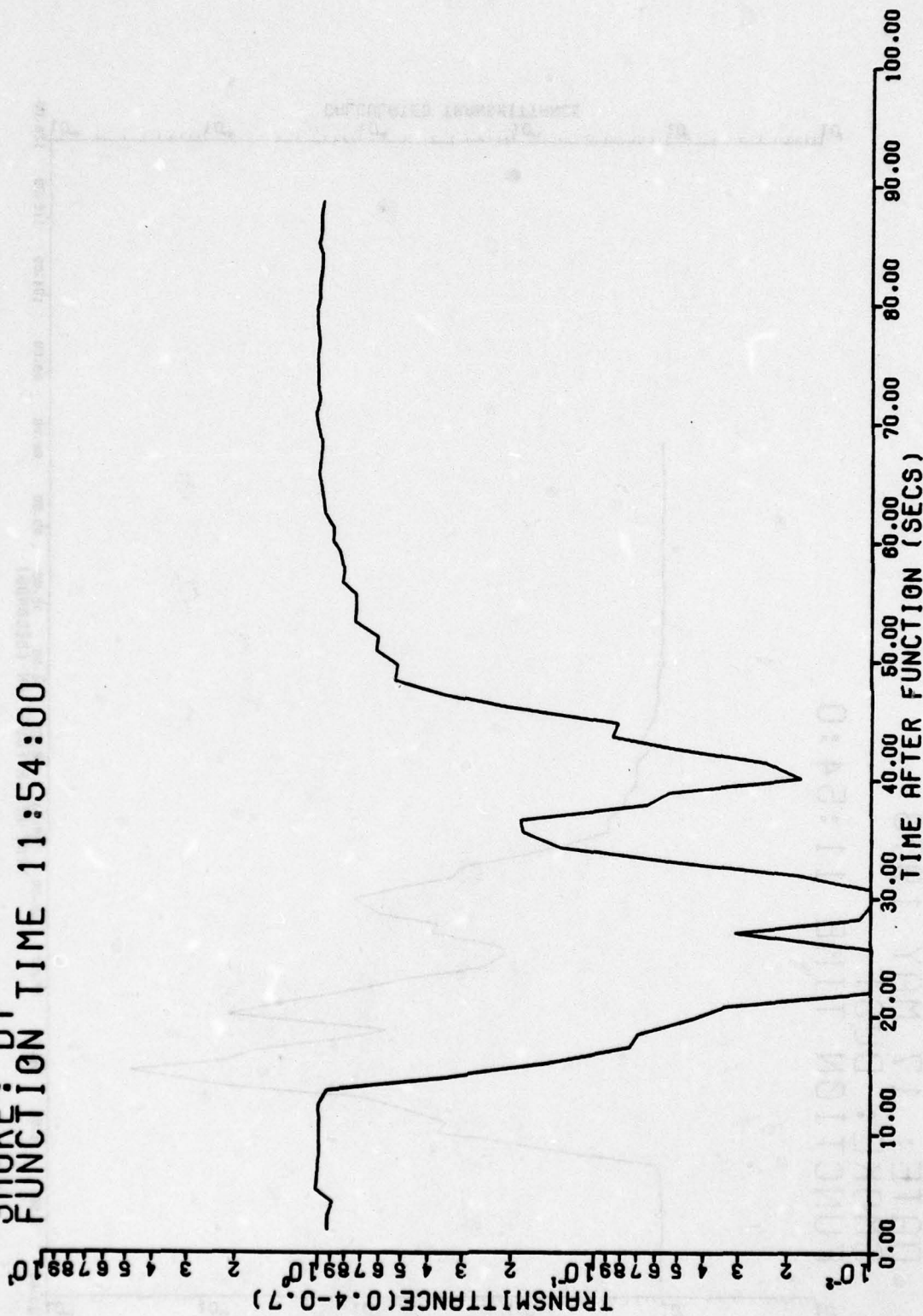
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 (μm)

TRIAL #21 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 11:54:0



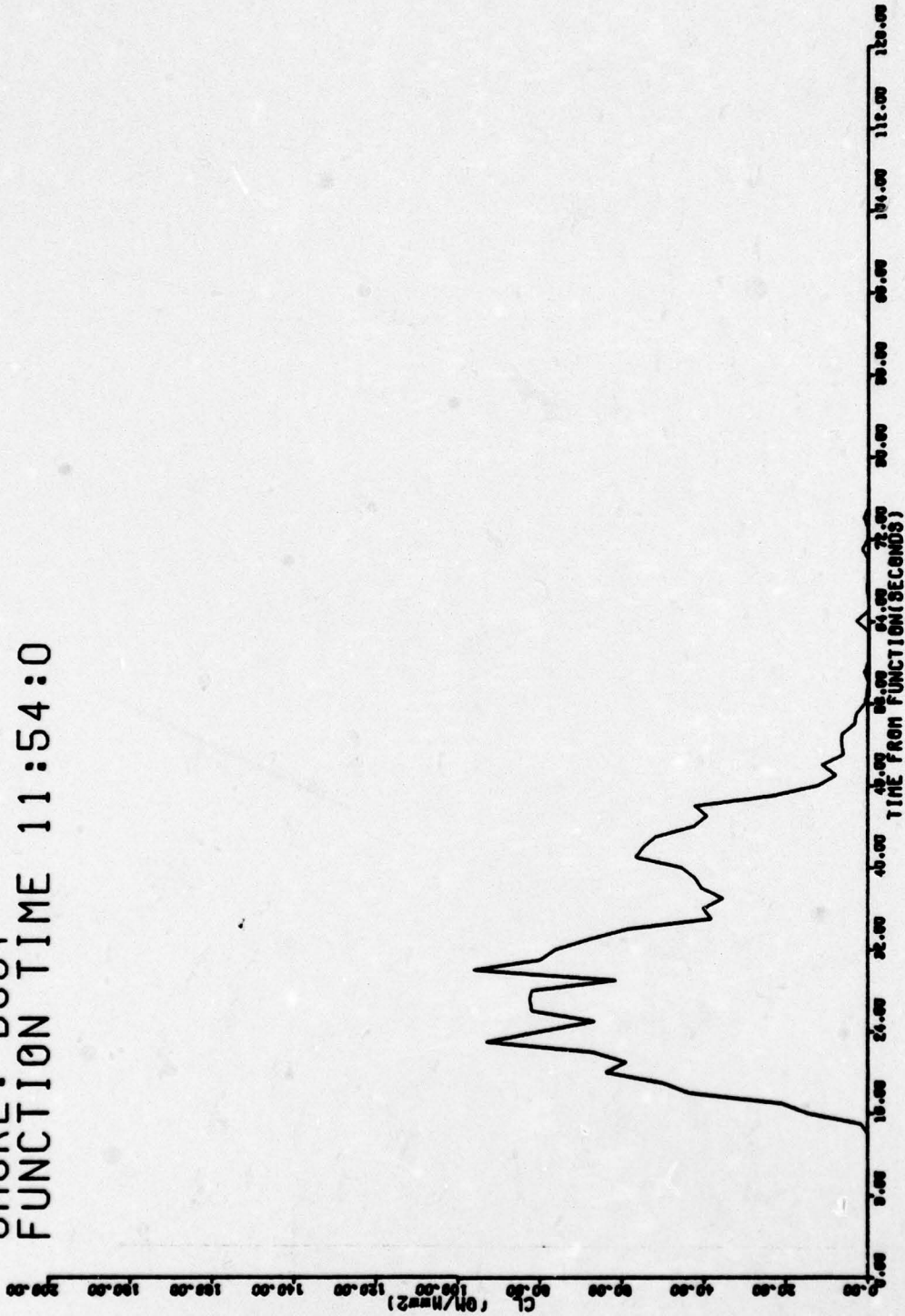
CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 21; FT. SILL TESTS  
DATE: 17 MAY 1978  
SMOKE: DT  
FUNCTION TIME 11:54:00



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu$ m)

TRIAL #21 [DP1-005]  
 DATE: 17 MAY 1978  
 SMOKE: DUST  
 FUNCTION TIME 11:54:0



CL VALUES VERSUS TIME  
 CALCULATED USING TRANSMITTANCE AND EXTINCTION COEFFICIENT

APPENDIX B, SECTION 25

CONTENTS

TRIAL DPI-005-T22 (DUST) 17 MAY 1978

PAGE

B-25-2

TABLE OF TEST DAY DATA

B-25-3

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
9.750  $\mu\text{m}$

B-25-4

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-25-5

FIGURE: CLOUD LUMINANCE VERSUS TIME FOR WAVELENGTH  
1.06  $\mu\text{m}$

B-25-6

FIGURE: CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7  $\mu\text{m}$

B-25-7

FIGURE: TRANSMITTANCE VERSUS TIME FOR WAVELENGTH  
BETWEEN 0.4 AND 0.7  $\mu\text{m}$

# SUMMARY OF TEST DAY DATA

TRIAL: DPI-005-T22

DATE: 17 May 1978

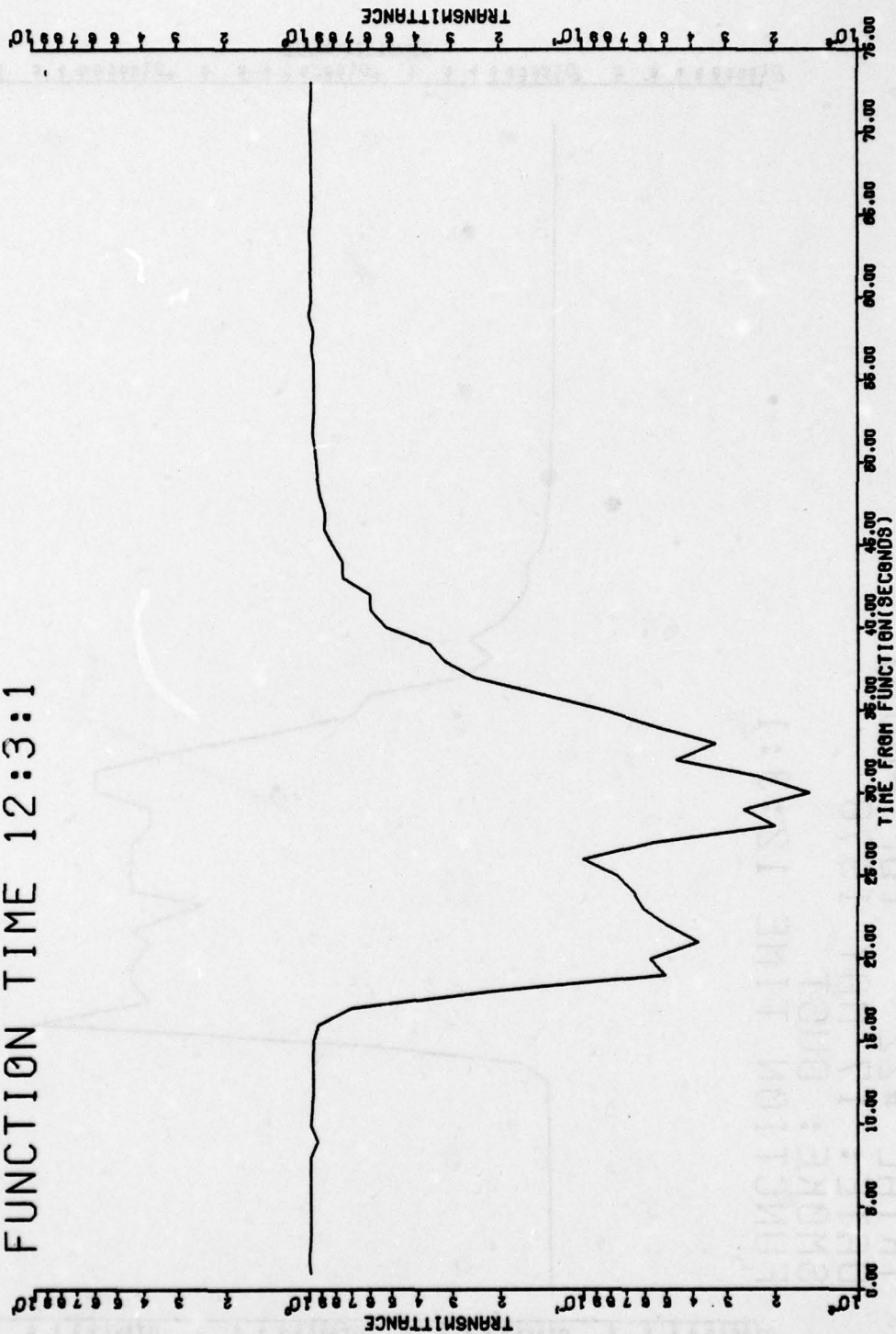
TIME: 1203

Wind Direction, degrees (2 meter) . . . . .	130
Wind Speed, $\bar{u}$ , meters/second (2 meter) . . . . .	6.2
Relative Humidity, percent (2 meter) . . . . .	81
Temperature . . . . .	65°
Sky Conditions . . . . .	overcast
Type of Munition . . . . .	M1, 105 mm
Number of Munitions . . . . .	5
Munition Detonation Location Referenced from Sampling Grid Center	
Azimuth (°) . . . . .	097*
Range (meter) . . . . .	118
Particle Size Range ( $\mu\text{m}$ )	Proportion
0.65 - 1.3 . . . . .	0.52
1.3 - 2.3 . . . . .	0.39
2.3 - 10.0 . . . . .	0.08
10.0 - 15.0 . . . . .	0.00
15.0 - 20.0 . . . . .	0.00
> 20.0 . . . . .	0.00
NMD ( $\mu\text{m}$ ) . . . . .	1.23**

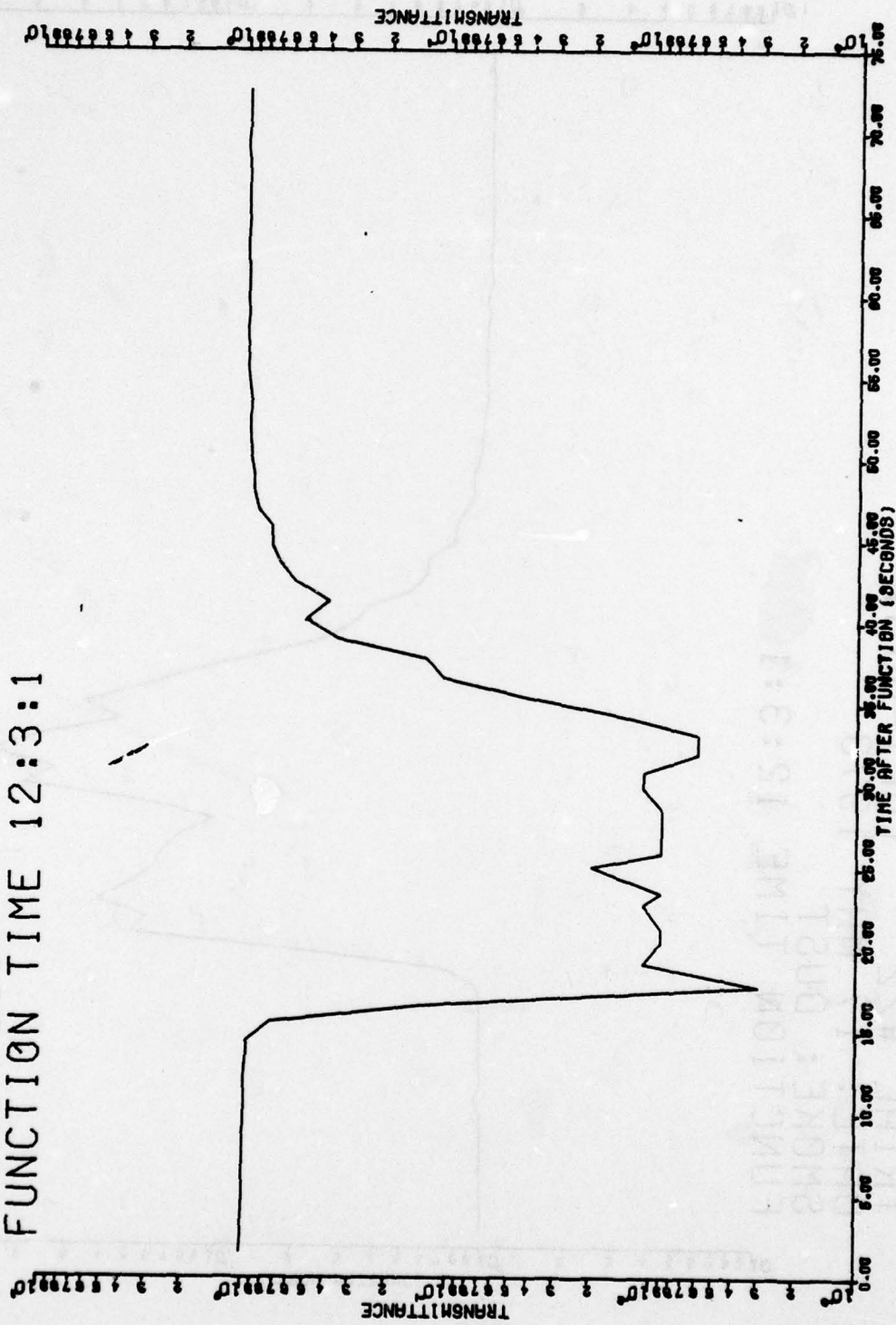
\*Average Azimuth and Range for first and fourth rounds

\*\*Graphical estimate provided

TRIAL #22 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:3:1

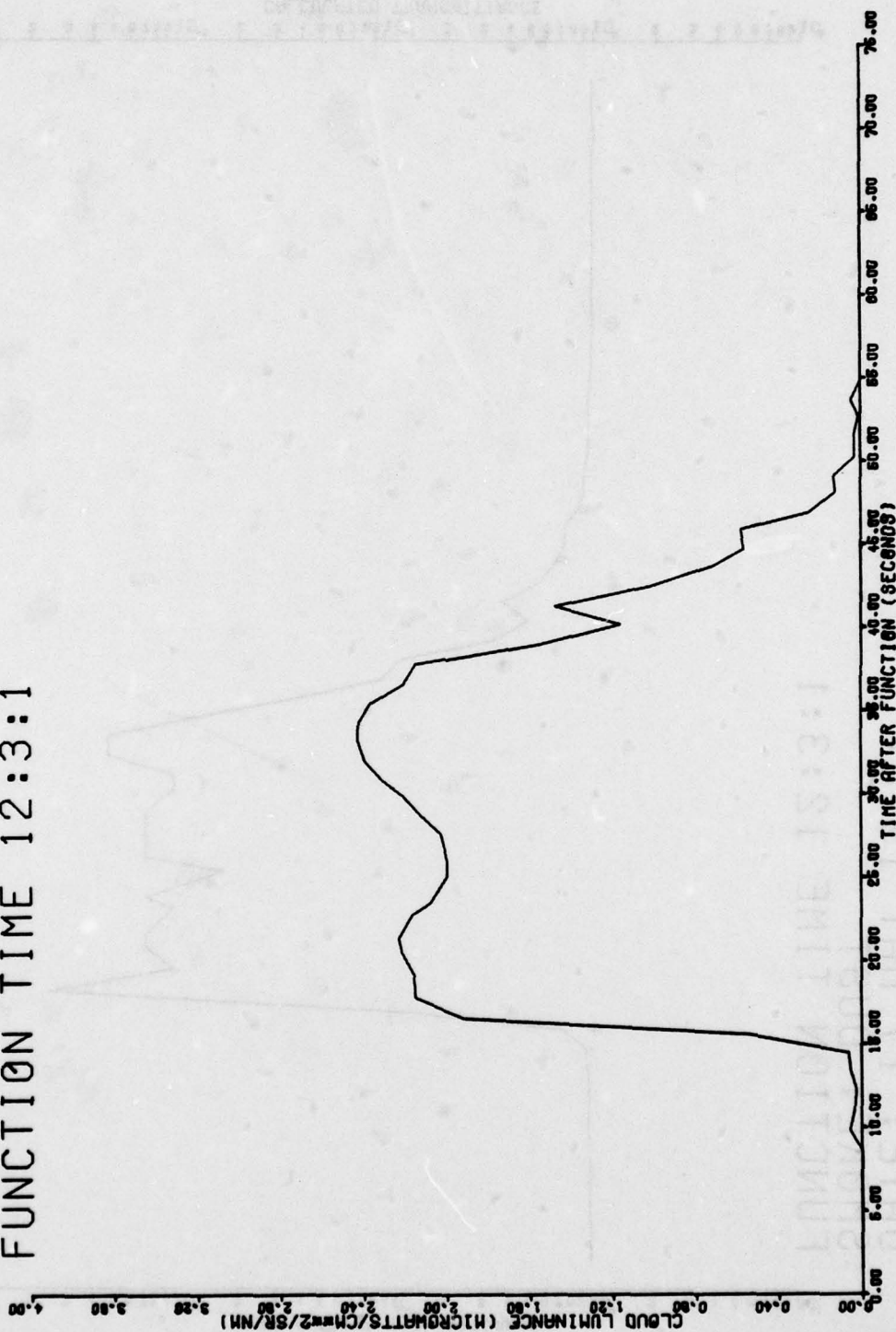


TRIAL #22 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:3:1



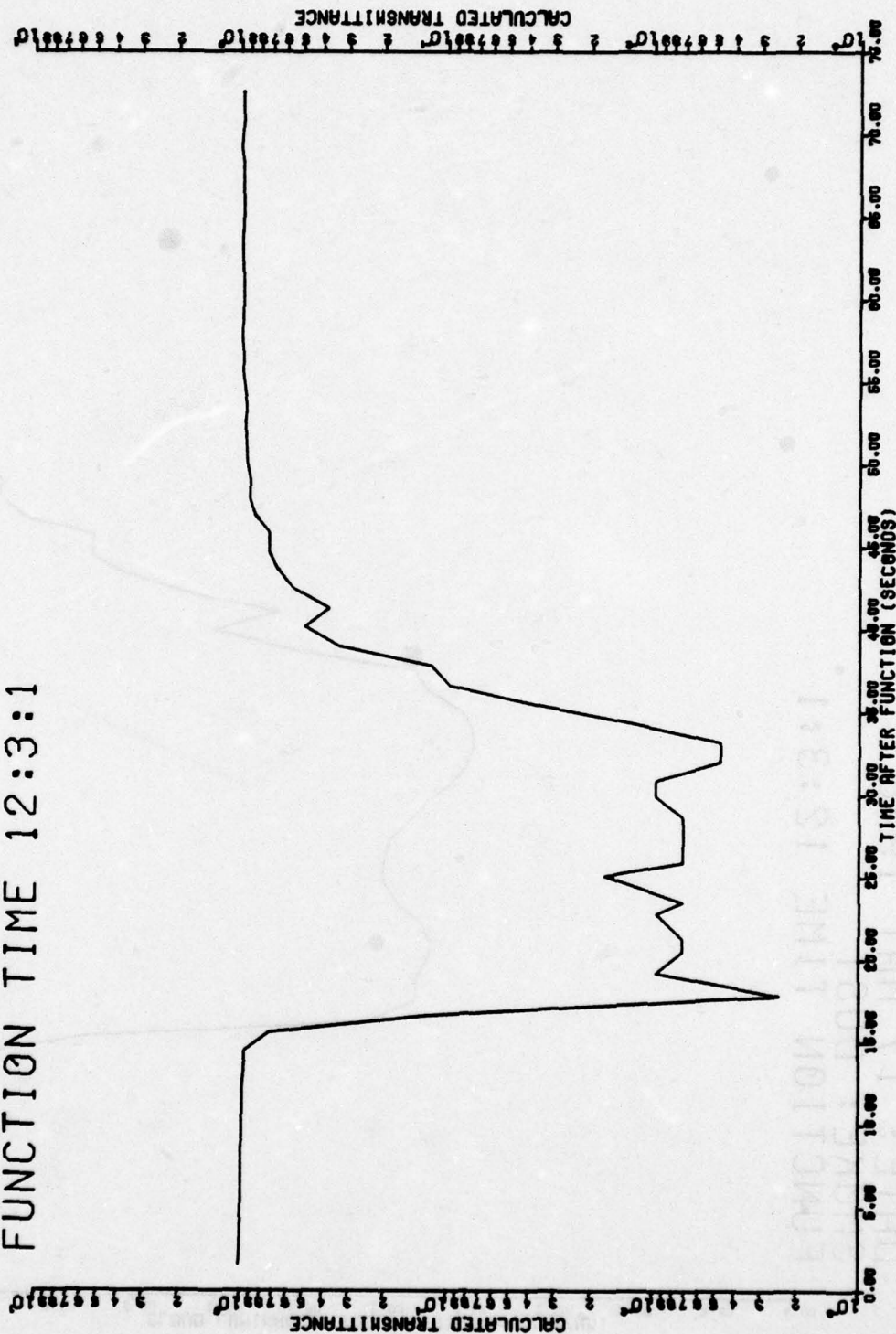
TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #22 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:3:1



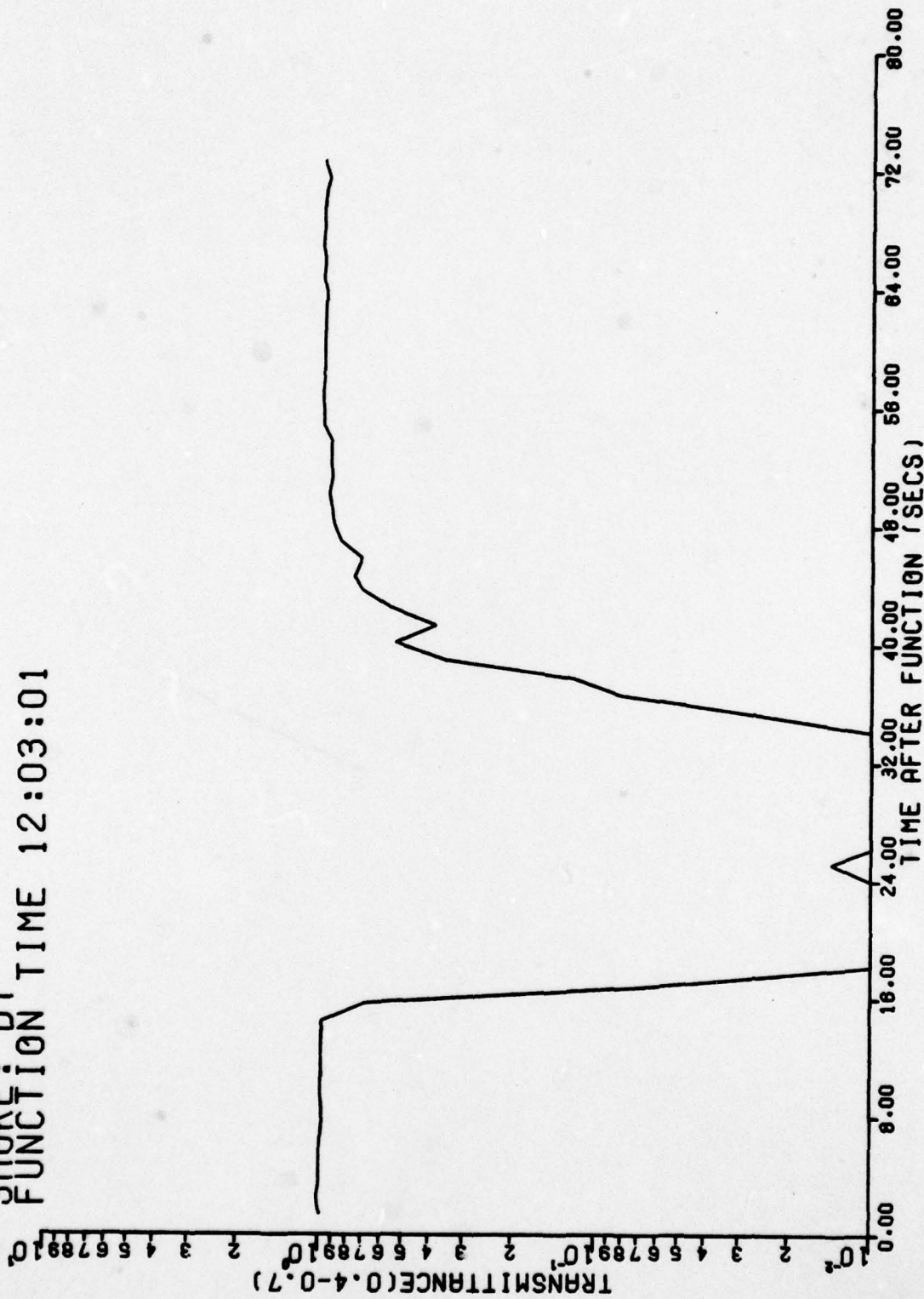
CLOUD LUMINANCE VERSUS TIME FOR  
WAVELENGTH 1.060 ( $\mu\text{m}$ )

TRIAL #22 [DP1-005]  
DATE: 17 MAY 1978  
SMOKE: DUST  
FUNCTION TIME 12:3:1



CALCULATED TRANSMITTANCE VERSUS TIME FOR  
WAVELENGTH 0.4-0.7 ( $\mu\text{m}$ )

TRIAL 22; FT; SILL TESTS  
DATE: 17 MAY 1978  
SMOKE: DT  
FUNCTION TIME 12:03:01



TRANSMITTANCE VS TIME FOR WAVE LENGTH BETWEEN  
0.4 AND 0.7 ( $\mu\text{m}$ )

APPENDIX C

DEFICIENCIES, SHORTCOMINGS, AND  
SUGGESTED IMPROVEMENTS

### APPENDIX C

In general, the system functioned as designed and required data were acquired. In addition, data on several parameters not requested by the test proponent were obtained since they did not involve significant additional cost. Improvement in particle size data would have resulted if unmodified particle size analyzers, or their low-range setting, had been used. The particle size distribution of the Quanah Range dust was lower than expected as indicated by measurements on site, and as subsequently confirmed in the laboratory.

APPENDIX D

MAINTENANCE DATA

Not used

#### APPENDIX E - REFERENCES

1. TWX, P 142055Z, April 78, PM Smoke, APG, MD, DRCMP-SMK-T, Subject: Test and Cost Estimate Request for DPG Safari Support of Dust Tests at Fort Sill and Ft. Knox.
2. TWX, P 111735Z, May 78, PM Smoke, APG, MD, DRCMP-SMK-T, Subject: Test and Cost Estimate Request for DPG Safari Support of Dust Tests at Ft. Sill and Ft. Knox.
3. Field Operation Procedures for Dugway Proving Ground Safari Support of Dust/Debris Test at Ft. Sill, Oklahoma.
4. Characterization of Obscuring Clouds in the Field (U). Lothar L. Salomon, E. G. Peterson, E. W. Burgess, W. Gooley, Jr. and F. L. Carter, Proceedings of the Army Science Conference, June 1978, West Point, New York.
5. Dust Trial Phase of Inventory Smoke Munitions Test (Phase IIa), Final Test Report, TECOM Project 7-CO-RD7-DPI-002, US Army Dugway Proving Ground, Dugway, Utah 84022.

## APPENDIX F - ABBREVIATIONS

DPG	Dugway Proving Ground
CL	Integrated concentration along the line of sight
CP	Command Post
PSA	Particle Size Analyzer
Z-Time	Time when munition impacted on the grid
mw	Microwatts
cm	Centimeter
sr	Steradian
nm	Nanometer
gm	Grams
m	Meter

APPENDIX G - DISTRIBUTION LIST

Addressee		<u>Copies</u>
Commander US Army Test and Evaluation Command ATTN: DRSTE-AD-M Aberdeen Proving Ground, MD 21005		2
Commander US Army Materiel Systems Analysis Activity ATTN: DRXSY-GP Aberdeen Proving Ground, MD 21005		1
Project Manager for Smoke ATTN: DRCPM-SMK-T Aberdeen Proving Ground, MD 21005	Vol 1 & 2 Vol 1	1 9
Administrator Defense Documentation Center Cameron Station Alexandria, VA 22314	Vol 1 & 2	1
Commander US Army Dugway Proving Ground Dugway, UT 84022		9
Distribute as follows:		
ATTN: STEDP-SC		1
MT		2
MT-DA	Vol 1 & 2	1
	Vol 1	4
MT-DA-L	Vol 1 & 2	1